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THE AVERAGE Lake rates on freight last season were the lowest reported in five years. In 1897—a very poor year—the estimated average freight charge on all traffic to and from Lake Superior was 0.083c. per ton-mile, and in 1898 it was 0.079c. In 1899, however, it rose to 0.105, and in 1900 to 0.118c. The lower season rates brought the average down to 0.099c. in 1901, while in 1902 it fell still further, to 0.089c., on an average transport of 827 miles. These rates are, we believe, the lowest freight charges known anywhere in the commercial world.

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AN INTERESTING conference was recently held in London, under the auspices of the British Iron Trade Association. While the present conditions of trade here and abroad have put a stop to our iron and steel exports, our British friends anticipate a renewal of American competition in the future. The conference was therefore called to consider the possibilities and to devise methods for holding an increasing British trade. Some eminent ironmasters took part, and expressed their views on American conditions of manufacture; generally holding that, with some decline in our home demand, there would be an active struggle for foreign trade, on the part of American manufacturers.

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ON ANOTHER PAGE we give an interesting article on coal-cutting machinery, in which the advantages claimed for electrical transmission of power in a mine, are strongly set forth, and further claims are made for the class of mining machines which requires electricity for their operation. This side of the case is stated briefly; we call the attention of our readers to the statements given, and to the arguments, which are advanced by the writer. We have no doubt however, that there is something to be said on the other side, and we hope in due time to hear from those who prefer the use of compressed air, or other methods of transmitting power, in similar cases.

A RECENT COMPARISON made by our esteemed contemporary, the London *Iron and Coal Trades Review*, shows that the entire mineral traffic of Great Britain, large as it is, barely exceeds that carried by the Pennsylvania Railroad alone in this country. Taking the Pennsylvania report for 1901 we find that that road carried a total of 69,985,715 tons of coal and iron ore, while its tonnage of finished iron and steel was 12,027,316. This gives, in round figures, a total of 82,000,000 tons. The total mineral traffic of Great Britain for the same period was, also in round figures, 300,000,000 tons. The average haul of the Pennsylvania was about 110 miles, while the average haul on British railroads was only about 30 miles, so that the total movement of minerals in Great Britain was about 900,000,000 ton-miles, while that on the Pennsylvania was 902,020,000 ton-miles. The comparison in favor of the American road would be much more favorable, if the transport of building stone, sand and the like were included.

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THE COMMISSION on the silver question appointed by President Diaz is now in session at the City of Mexico. This Commission has a curiously cosmopolitan membership, and includes many men of marked ability. For convenience it has been split up into committees, of which the fourth is deputed to collect information in regard to the evils and advantages of the decline in silver. This particular committee, which necessarily is one of great importance, has not a single member representative of the mining interests; in fact, it may be said that the Commission as a whole is, in its composition, by no means likely to lean toward the mine owners, although that distinguished engineer, Senor Jose de Landero, is conspicuously present. Men of the type of Senor Enrique Creel, the banker of Chihuahua, are more likely to make their influence felt.

The expansion of industry in Mexico to-day is based upon gold mining, which is benefiting from the fact that labor is low-priced, because payable in depreciated silver. This will have a tendency to bring the country towards the gold basis; but a long road must be traversed before any material change can be made. Meantime, it is satisfactory to see that Mexico is moving cautiously, if slowly.

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THE REPORT OF the Rio Tinto Company, an abstract of which was published in our columns last week, shows that the operations of this venerable mine still continue on a very large scale. There was some falling off in pyrites mined last year, both for shipment and for local treatment. The quantity of copper produced at the mine showed an increase, which was doubtless due to the erection of smelters to treat a portion of the ores; but on the other hand, there was a decrease in the copper-content of the ore shipped abroad. These changes will probably con-

tinue, as, with the continued work of the furnaces, it may be expected that the greater proportion of the better grade of ore mined will be treated in Spain. The amount of work done at the refining works in Great Britain will be correspondingly decreased, as the metal received there from Spain will be in the form of converter bars, ready for immediate treatment, instead of the cement copper, which has heretofore been shipped. Like many mining companies, the Rio Tinto found its receipts reduced on account of the low average price of copper last year. The company, however, was still able to pay dividends amounting to 50 per cent on its common stock. This was somewhat less than for 1899, 1900 and 1901, but was still greater than that of any earlier period. During the current year a better showing will probably be made.

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A PROTEST AGAINST THE BOYCOTT.

When, some twenty years ago, that long-suffering Irish land agent, Capt. Boycott, became the victim of a peculiarly cowardly form of social coercion, he never could have foreseen that his name eventually would become associated with the active rather than the passive side of the ugly quarrels between landlords and tenants, or employers and laboring men. Mining camps have surpassed even Irish hamlets in their exhibitions of rancor and reprisal. It has been left, however, for Ouray, a picturesque town near Telluride, but on the opposite side of the range—both topograhically and figuratively—to exhibit a manliness which does Colorado much credit; and in labor troubles, that State surely needs it. The business men of Ouray, so it appears, have signed and indorsed a resolution, which, for its outspoken good sense, is worthy of full quotation:

"Whereas, Notices have been circulated declaring in effect that a boycott will be enforced against all business houses in Ouray that do not display by May 1 what is known as the labor 'fair' card ; and,

"Whereas, The business men and property owners assembled here desire the prosperity of the whole community, and that friendship and cooperation exist among all classes, and at the same time we declare it to be the right of laboring people in whatever walk of life to organize for mutual protection and advancement, yet we do not recognize the boycott as a legitimate or permissible means of attaining any of the desired aims of labor. Now, therefore, be it

"Resolved, That we hereby declare our earnest opposition to the boycott being established in Ouray; we denounce it as un-American, unjust, unfair and brutal. We pledge ourselves to use every effort to stamp out this attempt to establish the boycott. We further pledge ourselves to organize for the purpose of helping laboring people and opposing any boycott, and we call upon every business man in this city to refuse unqualifiedly any action that will aid any boycott. We know that the prosperity of the community depends upon the prosperity of laboring people, but the boycott is destructive not only of prosperity, but of confidence and of a law-abiding sentiment. We deplore the ascendency of the irresponsible agitators and call upon sensible members of labor organizations to stand with us for mutual assistance and principles of American freedom and citizenship. We hereby direct the president of the Board of Trade to appoint a committee of five to prepare and submit a form of government for an anti-boycott league, to a future meeting to be called by the president."

We salute you, good citizens of Ouray! May the miasma of a cowardly coercion never enervate your manhood, and may the blue smoke of your happy homes ever rise in peace to those sentinel peaks which guard your lovely Alpine town!

LABOR TROUBLES IN CALIFORNIA.

The gold mining districts of California, which were once singularly free from the complications brought about by labor unions, have at last had to face the difficulties which appear nowadays to beset every form of industrial activity. During the past twenty years it has always been a pleasure to visit the foothill country of the Sierra Nevada and to pass through the succession of prosperous mining towns, which are linked by the far extending productiveness of the great Mother Lode; it has been pleasant because the population appeared less nomadic than in other parts of the Western mining regions, the men were of the home-loving type, possessing pretty houses, flanked by orchard or vineyard and forming a part of a steady-going, contented community such as forms the foundation of the commonwealth of California.

All this is changed. The walking delegate has invaded these prosperous regions, envy and malice have replaced the former contentment, the laboring man has been persuaded to array himself against his friendly employer, and mine after mine is being closed down. In Amador the muffled thunder of the stamp mills is already stilled; the industrial death is spreading to the adjacent countries of Calaveras and Tuolumne, and we fear that it will not be long before, from end to end of the great mining belt of the Sierra Nevada, the working man will be acquiescing in his own ruin.

For a generation the gold mines of California have had a mining population unfettered by labor unions. Of late the activity of agents from other States, notorious for acts of disorder and riot, has resulted in the organization of labor unions, which now demand a recognition of themselves, an eight-hour day, and the right to trade and board wherever the men desire.

The narrow margin of profit which is yielded by mines celebrated for the production of a large tonnage of low-grade ore will render it almost impossible for the mine owners to concede these demands. Large mills and complete equipments of machinery of every kind may impress the working man as indicative of wealth and prosperity, but, as a matter of fact, many of the successful properties can only be rendered profitable when working on a large scale, and with painstaking economy. To decrease the working hours constituting a shift is to increase the cost per ton, and to this must be added the further tax of supporting a system which entails numerous irritations to employer and employed, loss of time by strikes, diminution of the authority of the superintendent, a general break in the cooperative spirit which makes a good workman. No wonder the mine owners are doing their very best to thwart the effort to domicile the labor union upon their properties. One other point invites comment. The demand for the right to board where he pleases would seem to be a fair request from the miner—until it is understood. Unless a man is well fed he is not equipped for the large amount of muscular exertion represented by his daily toil. Experience has proved that men who are unmarried, and therefore homeless, will not obtain for themselves food sufficient in quality and quantity to keep them in good health. Either from motives of economy or mere want of forethought they become underfed. To prevent this injury to the men themselves and to secure fitness in the laborers whom they employ, it has been found wise to provide boarding houses controlled by the mine owner where adequate nourishment is obtainable for a reasonable price. The miner of Western America is the best fed laborer in existence, and it is to this fact that he owes the efficiency which has enabled so much to be done by the engineering profession. It is rarely that the boarding house becomes an abuse in the hands of the mining companies, and, though like all human institutions, it has its defects, yet in their demand for its abolition the labor agitator exhibits his usual ignorance of the economics of an industry which he is doing his best to cripple.

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THE ST. LOUIS EXPOSITION.

Next week the centenary of the acquisition of the Louisiana territory will be commemorated by the dedication of the Louisiana Purchase Exposition at the city of St. Louis. It will mark another stage in the industrial progress of this country; and though the fairy city erected by the shore of Lake Michigan ten years ago was splendid in beauty and design, we do not doubt that St. Louis will eclipse the memories of Chicago. This is well enough, but we hope that, besides being a national fair, St. Louis, will accentuate those features which are educational in the broadest sense. We confess to a general weariness of expositions in so far as they represent advertising to the n-th degree, and if in the past we have valued the opportunity of seeing what Chicago or Paris could do it was mainly because the occasion afforded the privilege of meeting other men who were in attendance at those scientific or technical conventions, which find an exposition city a convenient place of meeting. Badly classified collections of everything under the sun, and exhibits of all kinds of machinery, with no one to explain their especial features, have, we confess it, driven us to the Midways and Picture Galleries. Cubes, pillars and pyramids of various metals and stones have evoked but little enthusiasm to our jaded sense of curiosity, and we have preferred to watch the exhibition of humanity as it wandered past with vacant eye and tired step. Once in a while we have encountered an exhibit with some one who was there to explain it—the Nicaragua Canal model, with a young man who could answer questions, the Kilauea cyclorama with several young men to do the same thing—these have been as oases of intelligent information amid a dreary Sahara of advertising.

We hope—we have reason to believe—that at St. Louis this educational feature will be kept in view. Among the important features there will be a map of the United States covering about ten acres of ground. Every division of the country will be defined and the boundaries will be marked by pathways along which the visitor can make the circuit of each miniature State. The products of each region will be represented, in a condition of cultivation. This will be a valuable object lesson. We hope there will be other similar methods

of making the fair an exposition indeed, and not merely an exhibition. If these world-gatherings are to serve the sole purpose of making known the products of manufacture, if they are to be department stores on a colossal scale, if they are to afford the means for collecting crowds, for making money by questionable shows and of incidentally helping a relaxed local real estate market, we confess our lack of interest in them, but if they are to facilitate the dissemination of accurate knowledge concerning the industrial arts of this and other countries, well enough; and if to this be added an effort to educate the sightseeing crowds who drift aimlessly through stately aisle and lofty collonade, then they will take rank as temporary universities for all men.

As a dinner is an excuse for bringing together people who are mutually agreeable, so an exposition affords the chance for men from distant parts to foregather. This was a great feature at Chicago in 1893. They met, they talked, they discussed science, art, and religion, they sought for new principles, they tried to discover new ideas —but they ended by discovering one another. This is what illuminates the dullness of many a gathering; after the froth and spray of the storm of talk is past, the surface of things carries a glow such as is seen on quiet nights on the South Pacific. In this way the noble idealism of the first exhibition, that to which Prince Albert gave an impulse fifty-two years ago, can be fulfilled and mankind may learn that there is a kinship which rises superior to the mere fortuities of place and the cold interposition of the sea.

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THE COPPER SITUATION.

There has been recently a good deal of discussion on the copper situation, and a good deal of criticism of published prices, from different points of view. On the one hand we hear rumors of large stocks and probable lower prices; on the other it is claimed that the recent reaction does not express the real situation, and that sales have not been actually made at quoted prices. We do not refer here to the New York Metal Exchange quotations, our opinion of which was fully expressed last week.

The fact is that the recent slight fall was the natural result of an advance which possibly was too rapid. While some large sellers have held for higher prices, the quotations given in our columns have followed actual sales made, and have expressed the prices which could be obtained for the metal at the time. Sales, indeed, have not been large, and for several reasons. Producers were not anxious to press metal on the market, when they believed that prices would soon recover. Most large consumers purchased heavily when copper began to rise a few weeks ago, and are generally supplied for the balance of this month and May; many of them well into June. Under these circumstances, they are not anxious to buy just now, and are waiting in the hope of securing possible further concessions on new contracts. In the meanwhile, consumption continues undiminished, and in a comparatively short time, consumers must be in the market again for large quantities. Export business has been very fair and consumption seems to be improving in Europe, although—in Germany especially—business is not yet on a satisfactory basis. It can be stated confidently that there are no large accumulations of metal here or abroad, and while production has shown some increase this year, it has not exceeded the demand.

In short, while business is temporarily quiet, the situation is strong, and there is no doubt that the recent advance was a legitimate one, based upon the actual conditions of trade. Like all such advances, it may have been carried a little too far, but not enough to justify any considerable decline.

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MARKET CONDITIONS.

While consumption generally continues large, and we hear good accounts from manufacturers and large consumers in all directions, various causes have conspired to render the markets somewhat quiet just at present, although no weakness has developed, the undertone being generally strong.

Copper has been quiet, and prices rather nominal, only very moderate sales being recorded. Prices, however, are somewhat better. The copper situation is considered more particularly in another column.

Tin is temporarily weak under the influence of some large arrivals from the Straits, and a consequent surplus of spot metal. It will take a little while to adjust conditions.

Lead continues to show a good current business at unchanged prices. Deliveries are somewhat better, as railroad transportation is improving.

Spelter shows little change, although buying has not been especially active during the past week. Consumption, however, continues at a fair rate. Ore prices in the Joplin District have fallen slightly, but still remain high. It is reported locally that the smelters are making a determined effort to cut down quotations for zinc ores, and sellers are prepared to resist any reduction.

Silver is firm and somewhat higher, the prospect of purchases for Philippine coinage, which will run over two or three months, tending to sustain the metal. There have also been some considerable orders for coinage from European countries. On the other hand, the recent increase in price has diminished the demand from India.

The iron and steel markets remain comparatively quiet, and no very new business is recorded. The recent purchases in the Pittsburg market have placed consumers in the Central West in an easy condition for some time to come. The Southern iron-makers have announced that no further reduction will be made in prices of Alabama pig, but buyers are still holding off in the hope of securing another reduction. Finished material is generally quiet, although some transactions in plates and structural material are reported. The only department in which there is at present any marked pressure to buy is in girder rails and other material for electric roads.

The Western coal trade remains quiet. The Lake firemen's strike has been settled, and the movement of coal to the Northwest has begun. This movement is likely to be very heavy for some time to come. The local markets are generally quiet.

The Atlantic seaboard bituminous trade continues rather quiet. Enough coal is coming forward to satisfy current needs. With better weather, more vessels are arriving at loading ports, and the coastwise movement of coal will show a considerable increase within a week. There are no serious labor troubles in the mining fields, and the outlook is not as threatening as it was a short time ago.

In the anthracite trade, the demand continues very heavy. Coal has started up the lake ports, now that the strike of firemen and oilers is settled. Operations at the mines have been disturbed by many small strikes, but these will probably be settled soon.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The tin deposits of Mergui, in Burmah, produced 70 tons of tin-stone during 1902.

An important find of tin is reported to have been made at Kit Hill, near Callington, in Cornwall.

The Bolivian tin ores are sent to Tostedt, Germany, to be smelted. From 3,000 to 4,000 tons are treated per annum.

Tin deposits have recently been discovered in the Kuils River District of Cape Colony. Both veins and alluvial occurrences are reported.

Rich tin lodes and gravel have been recently discovered on Ferguson Island, on the northeast coast of New Guinea.

Tin occurs in Swaziland, South Africa; at a distance of 40 miles from Barberton there is a tin mine which is stated to have dispatched already about 800 tons of tin ore to England, via Delagoa Bay. Stream tin also occurs in this region.

During 1902 Tasmania produced 1,958 tons of metallic tin, worth $1,189,140, and 131 tons of tin ore, valued at $25,810.

During the last quarter of 1902, Queensland produced 473 tons of tin, valued at $139,000. Of the total, 314 tons came from the Herberton District.

The output of tin in New South Wales during 1902 had a value of $268,530, a decrease of $118,045 as compared to 1901. The drought was responsible for this diminution, for the tin is obtained from alluvial deposits which can only be remuneratively worked when water in quantity is available.

The output of tin ore in Western Australia during 1902 amounted to 620 long tons, valued at $198,915, as compared with 734 long tons, valued at $200,000 in 1901. Of this total, the Greenbushes District produced 403 long tons, valued at $123,400, and the Marble Bar District 216 long tons, valued at $75,515.

In the Malay Peninsula, the Pahang Corporation reports, for the fiscal year ending June 30, 1902, an output of 22,763 tons of tin ore, yielding 622 tons of black tin of a value of $242,505. The ore averaged 2.9 per cent tin. The net profit for the year was $111,200; out of which a dividend of 10 per cent on the preferred stock was paid.

The three representative Cornish mines exhibit costs and yield for the year 1902 as follows:

	Costs per ton.	Yield of black tin per ton.
Basset	$5.13	36.00 lbs.
Dolcoath	4.74	40.78 lbs.
Carn Brea & Tincroft	4.64	26.49 lbs.

Of these only Dolcoath made a profit, at the rate of $1.73 per ton. This does not include the landlord's dues, which, when subtracted, left a net profit of only $1.30 per ton.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the Engineering and Mining Journal.

WATER IN VEINS. A THEORY.

The Editor:

Sir.—In answer to request for data, I take pleasure in giving you the following facts concerning conditions at the Morro Velho Mine, of the St. John del Rey Company, in Brazil.

First.—At what depth was the water-level at the time the workings first penetrated it?

I regret to say I am not able to answer this question accurately, as the bulk of the water was cut in the old workings some forty to sixty years ago, and practically no fresh springs have been cut since. It has been my experience in this locality that practically the whole of the incoming water is met with at the junction of the hard and decomposed rock generally running from a hundred to two hundred feet from surface. I remember Mr. Richards noticed the same thing at the Raposos Mine.

In sinking the new shafts the moment we finished with the decomposed rock and entered the hard rock we came across a considerable spring, and this was at a depth of 155 ft. from surface, we experienced exactly the same thing in driving the adit, at distance of 377 ft., but after cutting these springs we met with no other water until we arrived at Hor XI, 3,124 ft. from surface; here we came across a considerable quantity that was stored up in a vug, but it was soon drained and found to be only an accumulation.

Second.—At what level was the maximum flow encountered, and how much was it in gallons per minute?

That met with in the Old Mine I cannot locate exactly, but the bulk of it came from the junction of the hard and soft rock and the total amounted to about 20 cub. ft. (or 150 gals.) per minute.

Third.—How much water is coming from the bottom of the mine, stating the distance from surface?

Absolutely none. The only water we have to consider here (at a depth of 2,575 ft.) is that which comes down through the crushed excavations of the old mine; this, as you are aware, is drawn off through a bore-hole.

G. Chalmers, Superintendent.

Morro Velho, Miñas Geraes, Brazil, Jan. 15, 1903.

The Editor:

Sir.—It is of the utmost importance to learn the actual facts concerning the ground-water, and I consider Mr. Rickard's investigations and data, bearing upon this matter, valuable and stimulating. The point that our knowledge up to lately has been chiefly concerning the upper surface of the ground-water, and that the conclusions regarding its distribution and behavior in depth have rested entirely upon theory, is well taken. Like other logically worked out theories, these conclusions are good, if the premises be true. That is, if we have ground-water to an indefinitely great depth, and if we have innumerable openings in the rocks, also to a great depth, then the ground-water may circulate as has been supposed. But if we have only one of these conditions, or neither, what then?

The facts accumulated by Mr. Rickard are in accordance with those which have been cited by Kemp and Vogt, and make against the conception of an universal sea of ground-water, extending down into the remotely deep regions, unexplored by man. While I am unprepared to accept all the consequences of Mr. Rickard's simile of a hot-water heating apparatus, the conception of a surface tank, with connecting pipes below, seems to me to express more graphically the distribution of the ground-water than do the comparisons formerly made. Yet this is a rude simile, as its author himself remarks, and a better one could probably be found.

We must also, I believe, come to the realization of the fact that in some desert regions the ground-water level is not present at a great depth, as has been supposed, but the ground-water is lacking. The scanty moisture which falls upon the soil may be entirely removed by evaporation. This seems to be the case in some of the deep mines in Nevada

In short, the presence of ground-water in any amount must be held to depend upon the joint abundance of surface precipitation and of openings in the rocks. For physical and chemical reasons a comparatively thin zone of rocks, just below the surface, contains, as a rule, a relatively great proportion of fractures and other apertures; so that this zone may be compared to a clogged and leaky basin in which a good part of the surface water is collected. This basin is probably chiefly relieved by overflow, the water reappearing at the surface in the topographic depressions. Part of the water will pass downward through the fractures in the bottoming rock, and only reach the surface after a longer journey; but, in regions of great precipitation at least, the amount of water which leaks down must be small in proportion to that which overflows. It follows that the surface zone which is thus most filled with water, is the seat also of most active circulation, with all that that implies, in the way of decomposing and rearranging of material, and the concentration of valuable minerals.

As illustrating these points, I may quote from my report on the ore-deposits of Monte Cristo, Washington.[1] "The ground-water level at Monte Cristo practically coincides with the surface, and . . . while the rocks below the surface are generally filled with as much water as they can hold, their capacity varies greatly. Those portions which are nearest the surface, and which, as before explained, have open joints, have by far the greatest capacity; hence during wet weather this surface zone has abundant water circulation, while the rock underneath is comparatively dry. . . . The depth of the surface zone of maximum water circulation is naturally variable and indefinite, but it may be said to be generaly less than 250 ft. . . .

"It is a fact verified by abundant observation in the Monte Cristo District that the surface zone of maximum water circulation is roughly identical with the zone of upper sulphide deposition. . . . These relations sufficiently indicate why the amount of sulphides in the upper sulphide zone is almost always much greater than in the lower sulphide zone. The cases are frequent where the ores in a vertical 'lead' are almost entirely found within the zone of surface circulation, the deeper portions of the 'lead' containing only disseminated pyrites."

J. E. Spurr.

Washington, D. C., April 11, 1903.

WIDTH OF FURNACE RELATIVE TO TONNAGE IN COPPER BLAST FURNACE SMELTING.

The Editor:

Sir.—Following out the suggestion recently made in these columns as to the publication of data on this subject, I give below an account of some experiments recently made here which may be of interest to the profession, though not yet furnishing sufficient data to warrant any general conclusion.

The blast-furnace plant here was designed and built in accordance with the results of the Great Falls experiments of Mr. Klepetko, mentioned by Mr. Channing in his recent paper; the furnaces were 56 by 180 ins. at the tuyeres, 72 by 180 ins. at the top of the jackets and 18 ft. from tuyeres to charging floor. The method of charging used is hand dumping of larger coke barrows and mechanical dumping of large tram cars containing approximately 5,000 lb. each. Materials used are Butte ores, coarse concentrates and briquettes of flue dust and slimes, fluxed by converter slag and limestone.

On first starting up in February, 1902, considerable trouble was experienced from heavy crusts forming on the jackets, both ends and sides. Much of the end crusting was done away with by cutting off the end tuyeres—originally there were 12 tuyeres in front, 14 at the back, and 3 at each end—but the side crusts seemed to be due to improper distribution of the charge caused by the partial separation of its coarse and fine components by sliding from the car over a sloping charging plate and falling three or four feet into the furnace. The tendency was for the larger and heavier fragments to fall in the center, the finer materials remaining at the sides. The higher this drop the more pronounced the sorting action; so, as the natural expedient of keeping the furnaces full was found to make even worse crusts, the experiment was tried, in building two new furnaces, of making them respectively 3 ft. and 6 ft. lower than the original five furnaces. At the same time, as it was the intention to run with less depth of charge and lower blast pressure, the jackets were drawn in at the bottom so as to make these furnaces 48 ins. insead of 56 ins. wide.

Blast used on the original five furnaces was 28 to 30 oz., on the No. 6 (15 ft. deep) 26 oz., and on the No. 7 (12 ft. deep) 24 oz. Other blast pressures were used at times, but these were finally settled on as yielding the best results.

During a six weeks' run No. 7 furnace (12 ft. deep) averaged 352 tons of charge per day on 10.2 per cent of coke, while the four furnaces of the original type in that time averaged 397 tons of charge per day on 9.8 per cent coke. During this period a constant attempt was made to run No. 7 on the same charge and coke per unit as the other furnaces, but it invariably became crusted badly, and had to be put on a more fusible and ferruginous charge with a higher coke per cent until the crusts were burned out. However, during all this period, as was expected, it made about 4 per cent better matte than the others, which averaged 40.4 per cent copper. The average slag of all the furnaces assayed: CuO, 19 per cent; SiO_2, 43.3; FeO, 26.0; CuO, 21.8, and Al_2O_3, 8.0.

During another six weeks' run No. 6 furnace (15 ft. deep) averaged 383 tons per day on 9.7 per cent coke, which the four furnaces of the original type averaged 407 tons per day on 9.6 per cent coke, all the furnaces being practically all the time on the same charge. No. 6 made matte averaging 42.6 per cent copper, the average of the others being 39.7 per cent copper. The slags of all the furnaces averaged: CuO, 18 per cent; SiO_2, 44.0; FeO, 26.0; CuO, 21.8; Al_2O_3, 6.8.

During four of the six weeks of this latter experiment No. 3 furnace also had the jackets drawn in to make the size 48 by 180 ins. at the tuyeres, though remaining as before 18 ft. in depth. During that time it averaged 397 tons per day on 9.3 per cent coke, while the three unaltered 18-ft. furnaces averaged 409 tons on 9.6 per cent coke. The No. 6 matte averaged 0.5 per cent less than the 56 by 180-in. furnaces. Fed high and blown the same as the others it would nearly keep up in tonnage, but it makes the lower grade of matte—with less blast, even down to 20 oz., and fed low it still made 0.5 per cent poorer matte, and, of course, fell still further behind in tonnage.

The above figures as to tonnage are compiled from our charge foreman's reports. The actual amounts smelted, owing to our method of loading the charges, always ran about 10 per cent more after being checked up by the railroad weights; quite the contrary result from that obtained by most plants on checking against railroad weights.

[1] Twenty-second Annual Report United States Geological Survey, 1901, Part II, p. 858.

None of these changes seemed to have any appreciable effect in lessening the crusts in the upper part of the furnaces, though the 18-ft. furnace contracted to 48 by 180 ins. at the tuyeres kept hotter and in better shape at the bottom. We have, however, as the feeders became more accustomed to the system of charging, been able, on all the furnaces, largely to prevent the formation of such crusts as would seriously retard their running.

In the experiments on No. 6 and No. 7 furnaces the differences in depth interfere somewhat with drawing, a conclusion as to the effect of the narrower width *per se;* while the results on No. 3, though showing a decided increase in tonnage per square foot of hearth area, certainly do not indicate that the narrower width is *per se* a commercial advantage in smelting our materials. However, the results on No. 6, showing a slightly decreased tonnage but an increased grade of matte, and a slightly decreased power expense, owing to the lower blast pressure, may readily be held to indicate a commercial advantage for the 48 by 180-in. furnace of 15 ft. depth in a plant where cost of converting is an important item.

Our experience here leads me to differ from Mr. Van Liew as to the advantage of mechanical charging. Until 1902 we were here running a number of furnaces 45 by 100 ins. at the tuyeres and 11 ft. from tuyeres to charging floor. Pretty much the same materials were used as in the 56 by 180-in. furnaces now in use, but in slightly different proportions; the small furnaces using about 38 per cent raw ore, 32 per cent of slag and matte, and 30 per cent of limestone, and making a slag containing about 39 per cent SiO_2, 26.6 FeO, and 22 CuO; while the large furnaces use about 45 per cent of raw ore, 27 per cent of slag and matte and 28 per cent of limestone, and make a slag containing about 42.5 per cent SiO_2, 26.9 FeO, and 21.2 CuO. The small furnaces were fed from small hand barrows, but so skillfully that they were kept practically free from crusts, while the large furnaces are fed from cars, as described above, and are generally somewhat crusted. The large furnaces use a larger coke per cent, though a comparison of the materials used would not indicate that this is entirely due to the mechanical feeding. However, the cost-sheets show that the excess in coke costs on the large furnaces is considerably more than balanced by the excess in labor costs on the small furnaces, while the larger furnaces get a still further advantage in the final cost per ton from the large divisor that their heavy tonnage gives them into the general expenses of the plant.

I think further data from plants smelting the same materials, in different models of furnaces, would be very generally appreciated.

GEORGE W. METCALFE.

Anaconda, Mont., April 10, 1903.

THE GEOLOGIST IN MATTERS OF PRACTICAL MINING.

The Editor:

Sir.—In his contribution under this title, Mr. J. E. Spurr deals fairly with the popular conceptions and misconceptions that prevail in respect to the liabilities of miners and geologists in practical matters of mining. I desire to second Mr. Spurr in his suggestion that the co-operative title of "mining geologist" suits the man who aims to make one science complementary to the other. It is much to be desired that this type of man may flourish—for he represents that application of science to industry, which we, professional men, continually strive to put into practice.

There is a difference between geological miners and mining geologists. The geological miner has too often been of the spectacled schoomaster type, the like of whom some humble philosopher had in mind when he said that "it is better to know less than to know too much that ain't so." To this man and to the chronic theorist is due the prejudice that exists against the geologist in the mining field. This need not have occurred if the professional man who examined mines had been first a miner and afterwards a geologist.

In discussing the limitations of geology as applied to mining, the first consideration is the personal factor. What is a man's qualification? Admitting that mining is impossible without some familiarity with the fundamental principles of geology, the next question is: How extensive a geological knowledge is really essential to the manager or superintendent, and what relation should such knowledge bear to other qualifications? Between the extremes of the unschooled miner and the specially trained geologist, there comes the mining engineer and mine manager who combines a useful knowledge of geology with a practical knowledge of mining; it is these men—the mining geologists—that direct mine-work the world over.

The man in charge of mines, or engaged in the inspection of them, may be presumed to be generally familiar with the work incidental to mining, and to be grounded in the branches of geology, surveying and sampling. There is nothing to bar a man who places much reliance in the power of geological observation from sharing with his confrere the faculty for doing business successfully, which is as necessary in mining as it is in other pursuits. Granted this much, it still remains that *the gift of observation and correct inference* is more useful to a miner (whether a mining engineer or engaged in superintending mine work), than book knowledge of the science of geology. I contend that a man of common school education, whose life has been spent in the mines, acquires a geological grounding which enables him to follow the vein and to make correct deductions from geological fact and observation, without any special book learning. This man, let us say, has been directing work in some particular mine over a period of years and has become familiar with its geological structure. Certainly his information and his familiarity with the "habit" of the vein is, in truth, geological, even though he be a stranger to technical terms. This man knows that under one set of conditions the ore "makes," and under another set of conditions it "peters," and he can give in his own way a very intelligent explanation of the conditions which contribute to these effects. These varying conditions pertain to geology and illustrate the rudiments of geology as applied to mining.

It often happens that geology finds no practical application in the regular operation of a mine. On the other hand, there are many instances, and of more importance, where mines are peculiarly dependent upon recognizable geological conditions. Cases could be cited where the owners of mines have blundered along and thrown away money in the search for ore, much, if not all, of which might have been saved by the earlier recognition of certain geological facts, discernible to the trained eye.

Generally speaking, one rarely encounters conditions underground so simple as to be entirely devoid of complication from dike intrusion, vein crossing, fault, or some other difficulty of a structural kind. On the other hand, many mines have been worked out while geologists were combating the theory of ascending versus descending solution, and they were exploited by miners to whom the word "decomposed" has probably served the purpose of more technical language.

The aid that geology gives mining may be conveniently summarized thus:

1. The discovery of new districts.
2. The mining of known ore-bodies.
3. The development of mines, with particular regard to the search for new ore-bodies.

1. *The Discovery of New Districts.*—Few mining camps have been discovered by the geologist; nearly all have been found by the untutored prospector. On this account many a sneer has been made at the expense of geologists. The fact is that the scientific mind must have data whereon to found its conclusions; the prospector by experience develops an instinct for the detection of the "ear-marks" of the deposits he seeks and is guided by data too subtle for analysis, like the woodcraft of the frontiersman or the weather wisdom of a sailor. The geologist requires more, and he does not get it until the mines are opened up. Therefore, he comes along later and does credit to himself by noting the facts, reconciling geological data and putting them into a harmonious explanation.

2. *The Mining of Known Ore-Bodies.*—It is under this head that geology has its narrowest limitations as applied to mining. It is a question of proper methods in the management and directing of men, the practice of all possible economy and the marketing and sale of the product of the mine to the best advantage. Admitting ordinary intelligence in following the vein, it becomes a question of profit and loss, in exploitation.

The geologist's training should help him to find the ore, it hinders him in the handling of it. He is out of his depth. Geologists make poor mine managers; for the same reason, because they have no practical acquaintance with the essentials of the business of mining, they often make poor consulting engineers.

3. *The Development of Mines with Particular Regard to the Search for New Ore-Bodies.*—There are many instances where geological conditions—in any particular formation—indicate a limit to the productiveness of a mine; and this might easily be overlooked by a man of limited geological training. It is often said that "no man can see further into solid rock than another." That, of course, is a fallacy. The man who has made a study of rock structure and the problems of ore deposition—the mining geologist—should have the advantage over other men, just as a specialist in any other profession is presumed to see more than lies on the surface.

In the transfer of mines it is necessary for an engineer to estimate prospective chances of future development. Such estimates must be based on conditions mainly geological and structural—they require a keen observation and an ability for inductive reasoning such as the training of a geologist is apt to afford.

Most of us can cite some instances in which, through geological data, the engineer has been able to locate his ore-body with almost mathematical precision: Take, as they come to mind, the Rand in South Africa,[1], the mines of Tombstone, Arizona,[2] and the Bendigo reefs in Australia.[3]

In the Witwatersrand, where the position and value of well-defined conglomerate reefs (occupying a basin-like syncline) are determined as closely as possible by a series of borings (sometimes exceeding 4,000 ft. in depth), the variation in dip, irregularities and deformations are plotted at the various points of boring, and it is through such accumulated data that the geological features of the field have been deciphered.

In the Tombstone District there occurs a combination of fissure veins and bedded deposits, which indicates an intimate relation between the deposition of ore and the structure and dynamic history of the sedimentary rocks in which the veins are found. Prof. Church shows that the rich bedded deposits lie in the anticlinal folds, and that the synclinal folds are barren. Here again geological conditions determine the locus of productive and unproductive ground, at least to the extent of affording a useful generalization.

The saddle formation of the Bendigo District

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[1] "Gold Mines of the Rand," by Hatch and Chalmers, and "Deep Level Shafts on the Witwatersrand," by Thomas H. Leggett, *Transactions* American Institute of Mining Engineers, vol. xxx, p. 947.

[2] John A. Church, "The Tombstone, Arizona, Mining District," *Transactions* American Institute of Mining Engineers, vol. xxxii.

[3] T. A. Rickard, *Transactions,* American Institute of Mining Engineers, vol. xx, p. 463.

further illustrates an interesting relation between the deposition of ore and the sedimentaries which inclose the deposits. Many other instances might be cited to show that geology has sometimes put hard and fast limitations both on the immediate as well upon as the prospective value of mines.

It may be argued that the mere origin ascribed to any particular deposit can be of but little value to the mine owner, and of still less concern from a commercial point of view. But if we disregard question of the causes that contributed to form the deposit, how can we gauge the persistence or non-persistence of the conditions which account for those concentrations of ore that we mine?

In the mining of gold and silver, and in metalliferous mining generally, instances are found, where within identically similar geological formations one locality will be rich in the workable ores and the other locality will be quite barren. Other cases can be quoted, where within similar (stratigraphical) formations, one set of veins will carry good values and another set, of like mineral composition, will prove unprofitable. This condition is sometimes illustrated, on a smaller scale, in the peculiarities of a rich "pay-shoot" within an apparently homogenous ore-body, where, with no visible change of character, one part of the vein within certain limits can be depended upon to assay well, while the portion outside of these limits will just as surely be poor.

The lesson of such inconsistencies is that neither similar strata nor similar structural conditions can presume the same genetic conditions for vein making. Every new district, and each separate mine, calls for separate study, and whether from the standpoint of a geologist, a miner, or a mining geologist, it does not do to go into a new district with one's judgment warped by all sorts of preconceived ideas of what a vein, in its habit, should do and should not do.

To be keen to make observation, to turn observation into correct inference, to put the idea into practice and work it out in the mine, this is what makes the miner successful and the geologist practical. The combination of these qualities in one man makes the mining geologist.

Forbes Rickard.

Denver, Colo., April 14, 1903.

THE ELLERSHAUSEN-WESTERN ZINC PROCESS.

The Editor:

Sir.—I should like to make a few comments on the Ellershausen-Western zinc-white process as described in an article by Mr. Edward Walker in your issue of March 14.

In the first place, I do not see any advantage in the use of acid ammonium sulphate over dilute sulphuric acid, while the former has distinct and serious disadvantages. A solution of zinc sulphate can be prepared very nearly free from iron by treating properly roasted ferruginous blende with dilute sulphuric acid. The amount of bleach necessary to render such a solution iron-free is trifling. On the other hand zinc hydrate is appreciably soluble in a solution of normal ammonium sulphate. Consequently, when zinc sulphate is treated with ammonium hydrate as much as 5 per cent of the zinc sulphate will remain in solution, and when acid ammonium sulphate has been used as the leaching agent, the percentage of zinc remaining in solution will be still higher. If now the ammonium sulphate be treated with lime and the ammonia distilled off, the zinc which was in solution will pass off with the calcium sulphate in the still effluent.

No mention is made of the difficulty of completely extracting the zinc from ores containing much iron. As a method of treating zinc blende so rich in pyrites as to be unfit for distillation in the ordinary way, I believe this process would leave much to be desired.

The suggestion that dissolved copper is to be removed by means of iron is very remarkable in the face of the claim that iron-free solutions are one of the features of the process. I may also point out that traces of nickel and cobalt are not infrequently met with in mixtures of zinc blende and chalcopyrite, and have a most potent effect on the color of the zinc white. Their removal from solution presents some interesting problems in chemistry, particularly when ammonium sulphate is present in the solution.

The equation $Zn\,SO_4 + 2\,NH_4\,HO = Zn(OH)_2 + (NH_4)_2\,SO_4$ does not represent what takes place when ammonium is added to a solution of zinc sulphate. The final result of the reactions taking place during the mixing of the solutions and the filtering and washing is:

$$5\,Zn\,SO_4 + 8\,NH_4\,HO = 4\,Zn\,(OH)_2\,Zn\,SO_4 + 4\,(NH_4)_2\,SO_4$$

but the actual sequence of events is more complicated than this. The washed precipitate consists of a basic sulphate of zinc of the above composition. It will be found that when four-fifths of the ammonia theoretically necessary (according to the equation given in the article) to precipitate all the zinc as hydrate have been added then further addition of ammonia causes no further precipitation, but on the contrary begins to re-dissolve the precipitate already formed, and the solution acquires an odor of ammonia. The difficulty of splitting up, by heat, a basic sulphate of zinc precipitate is too well known to need comment. If 3 or 4 per cent of SO_3 is left in the finished zinc white, the powder will become lumpy and gritty when exposed to damp air.

Lastly, the oxide of zinc obtained by calcining the precipitate resulting from the treatment of zinc sulphate solution with ammonia is never perfectly white, no matter how pure the reagents or perfect the conditions. It is always yellowish in tint, which causes it to take second place in value.

The above difficulties are some of those which have hitherto attended efforts made on similar lines to the Ellershausen-Western process to solve the problem of the hydrometallurgical treatment of zinc-blende. There is nothing in Mr. Walker's article to show how they are to be overcome or to indicate to any one familiar with the subject that there is anything of great value or novelty in the process.

Gilbert Rigg.

Hounslow, England, March 30, 1903.

THE SAMPLING AND ESTIMATION OF ORE IN A MINE.—IX.

By T. A. Rickard.

(*Continued from page 591.*)

In the case of a mine which contains several ore-bodies there are many useful suggestions to be obtained from a comparison of their characteristics. Careful investigation will lead sometimes to the detection of peculiarities applicable to the general occurrence of ore in that particular mine. The longitudinal section of the stopes warrants the close study given by a general to the map of the region which is to be the scene of his campaign. Stope-maps are not always correct; sometimes they are incorrect to a very misleading degree. A few measurements, at least, should be made to test this point, and occasionally, when the general accuracy of the surveys warrants a doubt, it is a good precaution to make one's own map of the mine, either personally, or by engaging the services of a reliable surveyor. The conditions are so diverse that it is impossible to give a typical illustration, but, by way of suggestion, I will append an example of inferences derived from a study of the old workings of a mine. It is a small mine; for, after all, the most perplexing of problems is a "prospect," and it is found in practice that the greatest mistakes and the exercise of the keenest judgment are alike exhibited in the appraising of the uncertainties of an undeveloped mine; therefore, the size of the property chosen as an illustration scarcely requires apology.

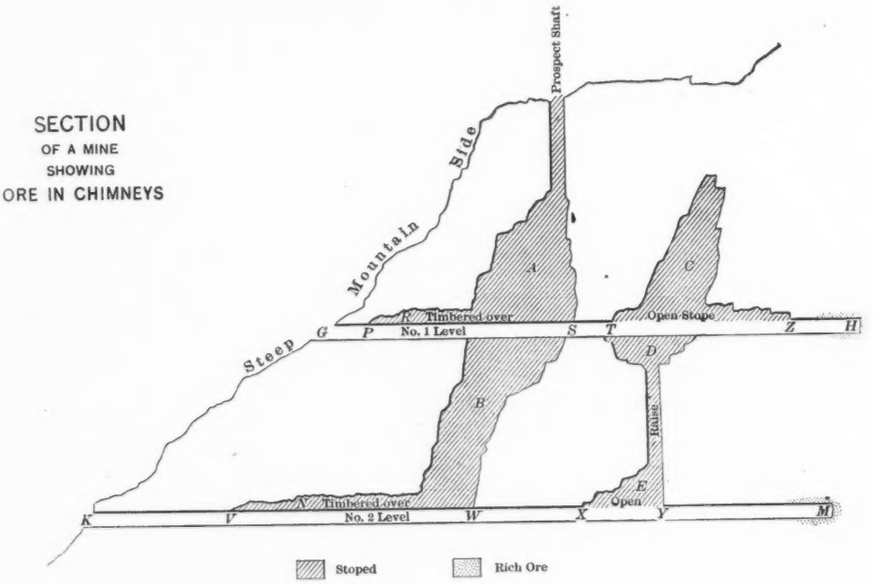
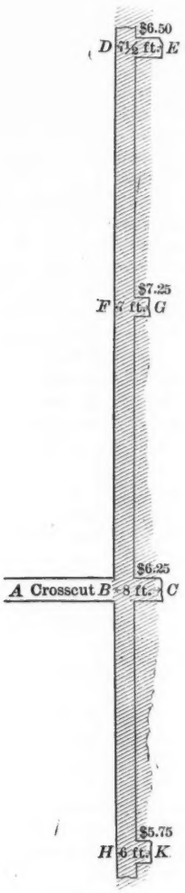


FIG. I.

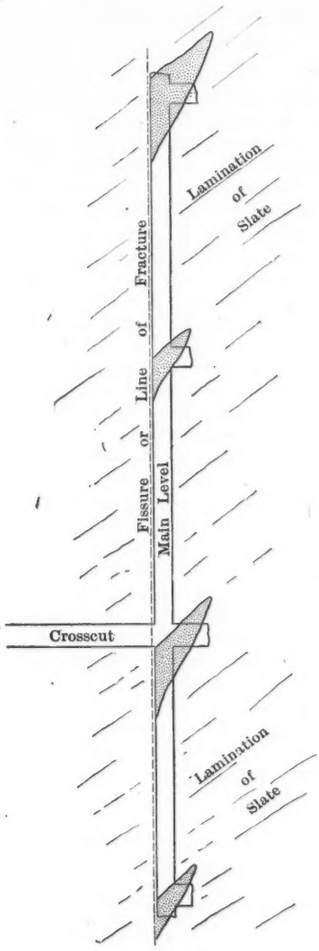
Fig. I represents a section of the workings. These consist of two adits, on the vein, together with a discovery shaft, which joins the upper level (G H), and a raise connecting the latter with the lower level (K M). The problem is to determine what weight should be given to the occurrence of a good width (say, 4 ft.) of very rich ore (say, 5 oz. of gold per ton) in the ends (H, M) of the two levels. In such a case it is most important to investigate, with thoroughness, the mode of occurrence of the ore-bodies previously encountered in the mine. This is not always easy; old workings have been allowed to cave or the ground is heavy and they are carefully timbered so as to impede examination. Sometimes this is intentional. In the case cited the upper level appears to carry one continuous body of ore from P to the breast at H, with a small comparatively barren interval S T. The timbering obscures the fact that the first half of

the stope P S is only a cutting-out stope, which was worked for the purpose of testing a low-grade portion of the vein; the same applies to more than two-thirds of the stope V W, at the lower level. Similarly, while the timbering between T and Z indicates a good length of stope, as a matter of fact the innermost half of this is little more than a cutting-out stope in comparatively poor ground. The truth is, the ore-body A B did not go to surface, having been first cut by the discovery shaft at 70 ft. down; it is a very short body of ore, almost a chimney, and it diminishes in approaching the lower level; further, the ore-body C D is still less persistent, it is a narrow short lens which does not hold out to the lower level nor does it go up more than half-way to surface, but it makes a sort of spurious connection, by means of the raise, with another patch of ore, E, on the second level. In practice, such workings as these are largely inaccessible and usually dangerous; as a consequence, the statements of an inaccurate superintendent, who desires to serve his employer by putting things in the most favorable light, are apt to carry more weight than they should, so that, with the usual desire for quick decision on the part of both the vendor and the vendee, the engineer may be pushed to a conclusion which the actual facts do not warrant. It may seem to one who has missed the essential character of these ore-bodies, through the failure to examine the old workings, that the good width of rich ore at H and at M indicates the beginnings of a big body of ore which persists, at least, from one level to the other, but, to another man, who has carefully studied the old workings, it is evident that the probabilities point merely to another narrow lens of uncertain extent. The moral is, don't allow yourself to be hurried into an opinion by either party to the transaction, and beware of workings which are stated to be inaccessible, because such inaccessibility may have a purpose.



PLAN
SHOWING SAMPLING
Supposed Ore

FIG. J.



PLAN
SHOWING LODE STRUCTURE.
Ore Lenses

FIG. K.

Another illustration will emphasize the warning conveyed in the last sentence. In Fig. J is represented the single level of a Californian mine which is reached by the western cross-cut shown to the left of the drawing. The level is 450 ft. long; owing to the fact that the country is a soft black slate the ground is very heavy and the level is closely timbered throughout, permitting of only occasional glimpses of ore, at the points where short cross-cuts have been run out eastward. At these places, D E, F G, B C and H K, the lode is plainly visible and exhibits from 6 to 8 ft. of fairly uniform quartz carrying an average of from 6 to 7 dwt. of gold, in a district where working costs are about $3 per ton. After sampling these cross-cuts, examining the little there was to be seen, and finding that the ground really seemed heavy enough to justify the close timbering over the level, the engineer came to the conclusion that he was dealing with one of those persistent ore-bodies not uncommon in that part of California, and he estimated the ore to have the continuity exhibited by the cross-hatching in the drawing. However, he had wholly misunderstood the real character of the ore-occurrence, as Fig. K will indicate. The close timbering was not necessary in order to sustain the ground alone; it was an excuse for obscuring certain facts. The quartz exposed by the several cross-cuts belonged to a number of small lenses. These abutted against the "fissure," or main line of fracture, which constituted the supposed lode; the lenses were short-lived and lay with their longer axis parallel to the layers of slate; the body at D E only lasted as far as two sets of timber; that at F G died out at 60 ft., and that at B C "petered out" at 40 ft. above the level, while the last one, H K, went up as a narrow body for a distance of 160 ft. Compare Fig. H with Fig. K and quote Hamlet's comment on his own portrayal of his mother's successive husbands. This incident did not befall a tyro, but an old campaigner who was caught by his own carelessness under circumstances from which only the greatest wariness could have saved him.

Misconceptions concerning the conditions contributory to the localization of ore shoots and the consequent mistaken ideas as to the future possibilities of a mine have often arisen from a misunderstanding of vein intersections. In the case of a well-known mine in southwestern Colorado a length of 2,700 ft. of ore had been opened up by an upper level, and stopes, which had worked out

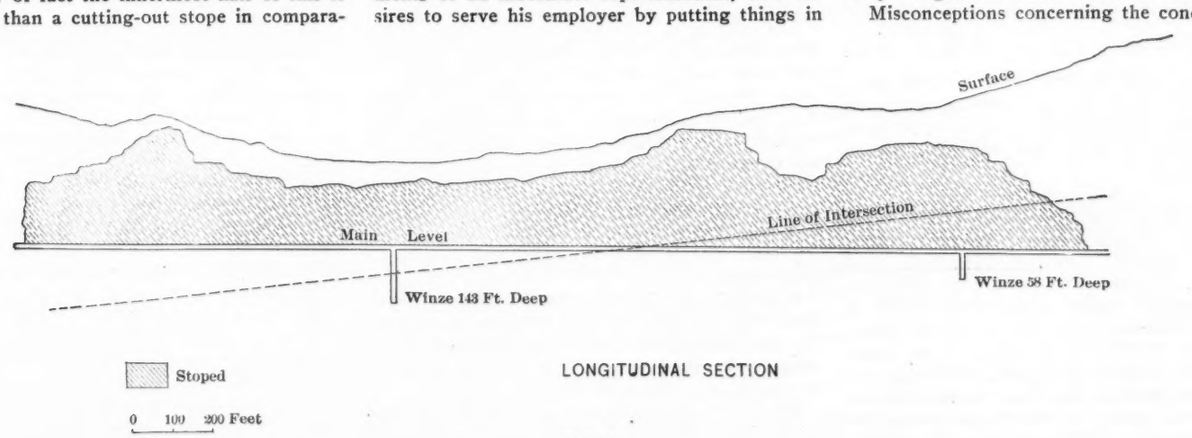


FIG. L.

most of the ore except at one end, had proved that it persisted to the surface, an average distance of 150 ft. above this upper level. In the meantime two winzes had demonstrated the apparent downward continuance of the ore-body. A longitudinal section of these workings is shown in Fig. L. In the examination of the mine by several distinguished mining engineers, it was assumed that the winzes, one of which was 58 ft. and the other 143 ft. deep, proved the continuity of the ore-body to an extent sufficient to warrant a price for the property which was a good deal in excess of the net profits to be won from the ground as measured to the bottom of the winzes. In the sequel it was found, after the mine had been purchased and when deeper workings had explored the lower horizon, that the ore-body owed its existence, and certainly its shape and position, to the intersection with another lode. This made a "scissors crossing," the hinge of which was a line, dipping west at angle of 7° 30'. The ore-body reached from this line to the surface, while downward it extended about a hundred feet or so. Other scattered smaller bodies of ore were, it is true, encountered, but the main ore-body of the mine, upon which its value was based, extended only about a hundred feet below the broken line shown across the longitudinal section in Fig. L. Such an instance as this proves the need for deciphering the conditions which have affected the distribution of ore. The crossing referred to was visible in the stopes at the east end, but only to an inquiring observer who suspected an eccentricity of lode structure.

(To be Continued.)

SPANISH IRON ORE AND AMERICAN COAL.—According to *El Mercantil Agricola e Industrial* of Seville, Spain, an enterprise is on foot, with a capital of 5,000,000 pesetas, which has for its object the importation of American coal, in return for Spanish iron ore, which it is stated will be furnished on a basis of 1,500,000 tons per annum. French vessels are to be used, advantage being taken of the Government bounty.

MINERAL IMPORTS AND EXPORTS OF SPAIN.—Imports of fuel into Spain for the two months ending February 28 were 308,781 tons coal and 28,001 tons coke; showing decreases of 38,117 tons and 2,865 tons, respectively. Exports of minerals for the two months are reported by the *Revista Minera* as follows, in metric tons:

	1902.	1903.	Changes.
Iron ore	1,103,145	1,232,121	I. 128,976
Copper ore	121,206	124,573	I. 3,367
Zinc ore	8,542	25,235	I. 16,693
Lead ore	471	460	D. 11
Iron pyrites	91,389	91,555	I. 166
Salt	38,354	39,794	I. 1,440

Exports of metals included 5,318 tons pig iron, against 8,661 tons in the corresponding period of 1901; 4,308 tons copper, against 3,369 tons; 309 tons spelter against 313 tons; 8,060 tons lead, against 9,501 tons last year.

IRON ORE SHIPPING DOCKS ON THE LAKES.—The Cleveland *Marine Review* says that a tabulated statement regarding dimensions, storage capacity, etc., of ore shipping docks, prepared by Chief Engineer Robert Angst of the Duluth & Iron Range Railroad, shows that there is an aggregate shipping capacity in ore docks of the upper lakes of about 40,000,000 gross tons, with storage capacity for 958,000 tons. Mr. Angst figures the new capacity of this spring at 106,356 tons, costing upwards of $1,000,000. This includes the Algoma Central dock, which was built two years ago and not then included in Mr. Angst's figures, though it should have been. Of the storage capacity more than half is at Minnesota ports. The Duluth, Mesabi & Northern docks at Duluth have storage capacity aggregating 167,040 gross tons and the Great Northern docks 168,000 tons; add to these two items 168,760 tons storage room in the Duluth & Iron Range docks at Two Harbors and the total for the two Minnesota ports is 503,800 tons, as against 958,000 at all points—Minnesota, Wisconsin and Michigan.

HOISTING FROM GREAT DEPTHS.*

By Hans C. Behr.

The following is an abstract of Mr. Behr's reply to the discussion[1] of his paper, read before the South African Association of Engineers.

After some introductory remarks and reference to earlier criticisms, Mr. Behr proceeded to point out, in reply, that tail-ropes are an untried device for depths beyond 2,600 ft. The fear that the swaying of longer and heavier tail-ropes might become destructive to runners and shaft timbering led to the adoption of the large cone drums for the projected depth of 1,200 meters, for Zeche Preussen II of the Harpener Bergbau Gesellschaft, Westphalia.[2]

M. Leon Poussigue, director of the coal mines at Ronchamp, states[3] that the whipping of the tail-rope is liable to become destructive to shaft lining and runners as well as to itself beyond depths of 800 meters, which, according to Dubbel, above referred to, is the limit to which tail-ropes have been tried. M. Poussigue also adopted cone drums for the new winders intended for a depth of 1,000 meters at the Ronchamp Collieries.

Taper ropes are to be used with these cone drums both at Zeche Preussen and at Ronchamp.

In the course of the present discussion Mr. Vaughan has remarked that: "It may be reckoned a sound deduction that the use of a tail-rope for high speeds and great depths is a mistake." Perhaps it is due to the fear of the dangerous swaying of the tail-rope that it was not adopted at the Red Jacket Shaft by Mr. Leavitt, the Consulting Mechanical Engineer of the Calumet and Hecla mines.

SHEAVE WINDERS.

Regarding sheave winders, Mr. J. F. Cook has stated that: "Sheave winders have been installed for depths varying from 1,500 to over 5,000 ft." They have been installed, it is true, but only one has been operated beyond a depth of 2,600 ft., and this not as it should be, i. e., with a tail-rope. This is the Whiting hoist at the Red Jacket shaft of the Calumet & Hecla above referred to.

The writer shares with many others the opinion that it is a risk to use heavy tail-ropes for great vertical depths, and considers their proposed application to depths beyond 3,000 ft. much more in the nature of an experiment than cone drums and taper-ropes, both of which have already been used for depths of over 4,000 ft.

The swaying of both main and tail-ropes would be particularly severe with heavy ropes combined with small moments of inertia as in sheave drives.

In view of all this, it does not seem to the writer that, because at Kimberley the tail-rope has been successful for a depth of a little over 1,800 ft., it can be taken as proved that tail-ropes can be used with safety for a depth of 5,000 or 6,000 ft. It is possible that even in winding plants of ordinary types not using tail-ropes, the whipping of the hoisting ropes themselves may become serious at very great depths.

It is such considerations that lead the writer to favor stage winding. In order to reduce swaying of the long rope at the lower stage it must be fitted with a guide-piece or cross-head near the middle of its length, the cross-head traveling in guides.

Mr. E. T. Sederholm has said that the moment of inertia of a Whiting hoist increases but little with the depth. Mr. Sederholm is mistaken in this. It does increase, but unfortunately chiefly in the rope, while it should increase in the sheaves. Take as example, for a depth of 3,000 ft. a Whiting with 12-ft. sheaves like those supplied to the Rand Mines, Limited. With a factor of seven based on the strength of the individual wires, the useful load being 8,000 lb., and the skip 5,000 lb., the rope should be about 1.3 ins. in diameter. The total weight of rope including tail-rope will be about 15,000 lb. The moment of inertia of the driving sheaves, calculated form actual drawings, is about 28,350. If the pit-head, deflecting and take-up sheaves be also 12 ft., their aggregate moment of inertia will be about 18,000. That of the loads results at 20,250, and that of the rope at 16,000, making a total of 82,600.

For a depth of 6,000 ft. the rope will be, under the same condition, about 1.7 ins. diameter, its total weight will amount to about 60,000 lb., having a moment of inertia of 67,500, thus raising the total moment of inertia to 134,100, an increase of 62 per cent for the same load and size of sheave, and due to the rope alone. The 12-ft. sheaves are too small for a rope 1.7 ins. diameter, where it has to pass so many sheaves in rapid succession as in a Whiting. If the sheaves are made 16 ft. then the total moment of inertia will become about 250,000, or over three times as much as for 3,000 ft. depth. The sheaves of the Whiting at the Red Jacket shaft of the Calumet & Hecla were made 19 ft. for a depth of only 4,900 ft. For a depth of 5,500 ft. the load must be increased in proportion to the time interval of the loads as compared with that for 3,000 ft., which would make the rope still larger and heavier and also necessitate a further increase in the size of the sheaves so that the moment of inertia will be again very much increased.

A sufficient moment of inertia is needed for smooth running, only in sheave drives, like the Whiting, the rope forms too large a proportion of the inertia, so that it is subjected to higher acceleration strains than if the greater increase were in the sheaves.

Messrs. Sederholm, Jennings and Robeson, in speaking of cone drums, refer to their large moment of inertia, and point to the existing examples which they bring forward. Inertia, however, is needed in drums and equally so in sheave drives, especially at starting when the speed is low and the accelerating force great, in order to reduce as much as possible the repeated excess of stress in the rope and the whipping of the latter due to the impulse of the engines, as was pointed out by Mr. Laschinger and several other contributors. Mr. Spengel also cited the case of the Koepe winder at Zeche Consolidation, for which the sheave had to be made heavier in order to reduce the effect on the rope. Ropes of uniform diameter, required with sheave drives, become heavier much more rapidly as the depth increases than a taper rope of the same strength, particularly if the factors of safety, which so far have been used as sheave drives, are not diminished.

STRAIN ON DRUMS.

Regarding the strain on drums, one has to be on guard against weaknesses due to faulty design, such as an excess of metal in the wrong place, causing weakness in one sense where strength was intended to be gained in another, as shown in the case of the Robinson Deep drum.

A drum 6 ft. in diameter by 20 ins. between flanges, the shell composed of a steel plate only ⅝ in. thick, was used at the Catlin Shaft of the Jupiter Gold Mining Company, Limited, in sinking down to a depth of 3,100 ft., which was reached in April, 1899. The load of rock was about 1,800 lb., the kibble weighed 600 lb., the cross-head 330 lb., and the rope was 1 in. diameter. The engine, after sinking with it to the depth named, was then used for other shaft work and raising water until October, 1899, and down to a depth of 3,750 ft. There must have been no less than 8 layers of rope on the drum, and if all the coils had been under full strain the shell would have collapsed at once. Other drums with plates of the same thickness have collapsed, but in

* Abstracted from the Johannesburg *Star*, of February 21, 1903.

[1] Abstracts of this discussion appeared in the Engineering and Mining Journal of November 29, December 6 and 13, 1902, February 14, 1903. Also an article by Professor Peele in the Journal of April 4, 1903.

[2] See article by H. Dubbel, Berg-und-Huttenwerks Maschinen auf der Industrie und Gewerbe Ausstellung in Dusseldorf, *Zeitschrift des Vereines Deutscher Ingenieure*, Vol. xxxxvi, June 28, 1902, page 954.

[3] *Bulletin de la Societe de l'Industrie Minerale*, page 261.

TABULATED STATEMENT OF SOME OF MR. BEHR'S DATA.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Case	Type	Depth	Output	Wt. of load	Wt. of rope	Wt. of skip	Starting moment	Maximum moment	I of drum	I of accel	Time to accel	Time full speed	Time to retard	Running time	Total time including stop and start	Max. velocity	Stress in rope	Factor of safety
		s		q	w	P	F	M_1	I	I	t_1	t_2	t_3	T		v_1		
I	Plain cylindrical, drums, no tail rope, 10 ft. dia. par'l rope.	2,000	120x24 = 2880	6,000	3,600	4,000	80,400	121,562	2x10,000	40,132	7.7	46.3	9	63	90	36 f.p.s. 2160 f.p.m.	30,000	7
IV	Cylindrical drums 12 feet diameter parallel rope tail rope.	3,000	120x24 = 2880	8,100	9,000 4,500	5,400	98,370	148,750	2x20,000	96,780	12	72	7.33	91.33	118.33	36 2160	30,000	7
V	Conical r = 4, R = 7.8 taper rope.	3,000	100x24 = 2400	6,000	6,600	4,000	76,900	116,270	2x40,000	110,600	23.21	40.56	16.58	80.35	107.35	68.2 3492	30,000	7
IX	Conical r = 5, R = 13, taper rope 4 sections.	6,000	100x24 = 2400	10,000	18,676	6,600	202,000	305,420	800,000	940,000	52.39	59.87	38.57	150.83	177.83	69.6 4176	35,000	7

If the max. shaft velocity were reduced to case V the load would be double case V and the engines would be three times case V for unbalanced load must use high pressure in all four cylinders.

the instance cited the material of the plates may have been of extra quality. The compression strain on the drum shell is also relieved somewhat at high speeds by centrifugal force counteracting compression in the drum shell.

The writer's drums, as given in his paper, have also been criticised privately from another point of view, in that, admitting the sufficient strength, the moment of inertia is inadequate for quiet running of the rope. In this criticism the writer admits there may be some force. In his original paper he neglected to bring out the point of the effect of the moment of inertia in equalizing engine efforts and thereby reducing the tendency of swaying of the ropes.

Both Mr. Jennings and Mr. Robeson state generally that the moments of inertia of the cone drums given by the writer in his paper, particularly those of Case IX,[4] are too low, and the drums, therefore, too light for proper strength, in view of existing examples of large cone drums, given in the exhibits and drawings accompanying their contributions.

There is really only one example which could be compared to Case IX, the drum of the Tamarack No. 3, since it is for the same depth of 6,000 ft., but in this case also other reductions to similar values must be made, so as to enable comparison. The writer assumes the dimensions given on Exhibit I to be correct. The drum of Exhibit I has end diameters 36 ft. and 14 ft., that of Case IX having diameters of 26 and 10 ft. The moment of inertia for Case IX is 800,000, that for the Tamarack 1,100,000. Mr. Norton stated in his contribution that a 1⅜-in. rope was used, which would weigh about 18,000 lb., or practically the same as the taper rope of Case IX. For simplicity, assume the rope of uniform size in Case IX, though this is unfair to Case IX, since the small end of the taper rope comes on the largest diameter of the drum, so that there is less weight and stress at the largest part of the drum where a reduction of cross-section has most influence in reducing the moment of inertia. If the shell were of the same cross-section in both cases, the end radii being about in the same proportion, the moment of inertia would vary as the cube of corresponding radii, which would, in this instance, give a ratio of 2.65. But the drum of Case IX is designed for a useful load of 10,000 lb., while that for the Tamarack drum is only 6,500 lb. In the former case, however, a skip weighing 6,660 lb. is used, while cars and cages are employed at the Tamarack. A cage and car hardly ever weigh less than the useful load. The weight at the large end of the drum is, therefore, under these conditions 16,660 lb. for Case IX, and 13,000 for the Tamarack, the ratio being 1.28. At the small end, owing to the weight of the rope, the forces are 24,600 lb. and 22,000 lb., with a ratio of 1.075. The first ratio counts more in proportion to the cube of its distance from the center, and the average ratio of thickness of drum shells for the two cases might therefore be about 1.25. But the drum shell of Case IX being smaller in diameter, must carry a larger number of coils, the number being greater in the inverse ratio of the diameter of drums, in this example about 1.4. The cross-section of drum shell in Case IX must therefore be 1.25 by 1.4, equals 1.75 times as great as in the Tamarack. The ratio of moments of inertia for the same cross-section was found to be 2.65. With the greater cross-section of the smaller drum the ratio becomes 2.65 divided by 1.75 equals 1.51. The moment of inertia of the larger drum should then be for the same stress in the material, 1.51 by 800,000 equals 1,208,000, instead of 1,100,000, as given in Exhibit I, or if the larger drum is sufficiently strong the smaller one might be reduced to 1,100,000 divided by 1.51 equals 728,476. This is without taking into account the smaller size of the taper rope and the consequent lesser stress at the large part of the shell. In reality, therefore, the drum of Case IX could be made still lighter than above.

The criticisms that the drums assumed by the writer were too light as regards strength having been disposed of, it would also be interesting to see what influence on the total time of hoisting a considerable increase of moment of inertia would have. The distance made during the acceleration and retardation periods, and the time required for these, are both proportional to the total moment of inertia, but the distance to be made at constant speed is correspondingly lessened, and the time of this period is, therefore, also reduced.

Take again Case IV, and double the moment of inertia of the drums. Then the total moment of inertia will be raised from 86,665 to 126,655, an increase of 46 per cent. The time used for the acceleration and retardation period was 12 plus 7.33 equals 19.33 seconds, and the distance made 261.25 plus 132 equals 393.25 ft. For the new conditions this part of the time will become 19.33 by 1.47 equals 28.22 seconds, and the distance 393 plus 146 equals 574 ft., leaving 3,000-574 equal to 2,426 ft. to be made at the constant speed of 36 ft., as in Case IV. The time for the period then results at 2,426 divided by 36 equals 67.39 seconds, and the total time of the trip 28.22 plus 67.39 equal to 95.61 seconds. The corresponding time in Case IV was 91.33, and if a short stop be assumed, making the total time 100 seconds for the original case, it will be 104.28 seconds, with the increased moment of inertia. An increase of 46 per cent in the total moment of inertia has thus only produced an increase of 4.28 per cent in the time of the trip. With a longer stop the percentage would be correspondingly less. It is thus evident that the detrimental effect of such increase of the moment of inertia of the drum in extending the time of hoisting is almost negligible.

OVERWINDING.

Mr. Robeson made the statement that with large moments of inertia in the drum it was much easier to overwind than when the moment of inertia is comparatively small, as in the Whiting. Such an overwind might occur in case of false indication, so that the driver did not shut off steam or apply the brakes soon enough, but the driver is naturally accustomed to shut steam off at a given point, with the heavier drum earlier and with the light sheave drive later in the run, so that the risk seems to be the same. When the question is one of running slowly, as when dumping a skip or landing timbers, the larger moment of inertia is most useful in equalizing, not only the variable engine torque, assuming the two engines to take steam equally, but also variations due to the engines not taking steam equally. The writer has noticed instances with flat rope engines, which have a small moment of inertia in the reels, that when running very slowly in landing timbers to place them in position, one engine was just crawling at the desired speed, and then, when the other engine took steam more plentifully, there was a sudden start, which, even with the most skilful drivers, could be only imperfectly controlled by very close attention to the brake. Such landing of timbers as well as dumping of skips, should therefore be more easily accomplished the greater the mass of the drum.

SHOCKS FROM CARELESS HANDLING.

Mr. Jennings makes the statement that: "The smaller the drums and cylinders of a winding engine, and the more uniform the speed, other things being equal, the less liability there is of excessive shocks from careless handling by engine attendants." A greater size of drum having a greater moment of inertia will act like a flywheel and reduce fluctuations of speed due to varying engine impulses. With the greater moment of inertia a greater distance must also be passed over before a given speed is reached; in other words, the velocity reached in a given distance will be less, so that if, for example, a certain amount of slack rope has to be taken up in starting a load, the shock will be less with the heavy drum than with the light one, because the speed at which the load is picked up is less, the effect being the exact opposite of that stated by Mr. Jennings.

It was shown that with light drums, the greatest proportion of the stress due to varying engine effort comes on the rope, being of greater intensity and more nearly in the nature of jerks than with heavy drums. These jerks have a particularly detrimental effect near the surface, where the length of rope between load and drum is comparatively short, and therefore much less elastic than when the load is near the bottom. When a tail-rope is used, the factor of safety at this dangerous point is not raised as in cases where no tail-rope is used. The tail-rope also adds to the mass of the suspended load where mass is undesirable, at the very time when shocks are likely to be most destructive.

(To be Continued.)

COAL MINES IN SPAIN.—The Mining and Metallurgical Company, of Penarroya (Spain) has taken over the coal mines at Horcajo and those owned by the Escombrera-Bleiberg Company at Villanueva del Duque.

GOLD MINING IN THE DECCAN, INDIA.—According to *Indian Engineering*, the Hyderabad Deccan Company did not work any of the gold mines in the Raichur Doab during the year 1902. Work on the Hootti (Nizam's) gold mines was started; but no gold was produced in 1902.

[4] See accompanying table, which reproduces Mr. Behr's principal data.

THE ZINC MINES AT ELLENVILLE, N. Y.

By Axel O. Ihlseng.

The marked activity in zinc mining and the wonderful production of ore by the New Jersey Zinc Company from the mines at Franklin Furnace, have caused a renewed interest to be taken in that district of New Jersey, and in the adjoining counties of Orange and Sullivan in New York.

A district that has been mined at various points decades ago, is in the Shawangunk Mountains, which extend northeasterly and southwesterly across the southern portion of New York State from Kingston to Port Jervis. The rounded crest of the range has an elevation of about 1,200 ft. The eastern face is underlaid by the Hudson River slates and sandstone, while the steep western fact is formed of sandstone and conglomerates of the Medina age, dipping 40° to the northwest. Along the contact numerous small fissure veins bearing lead and zinc are frequently found.

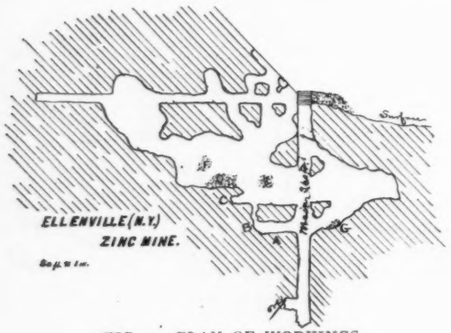
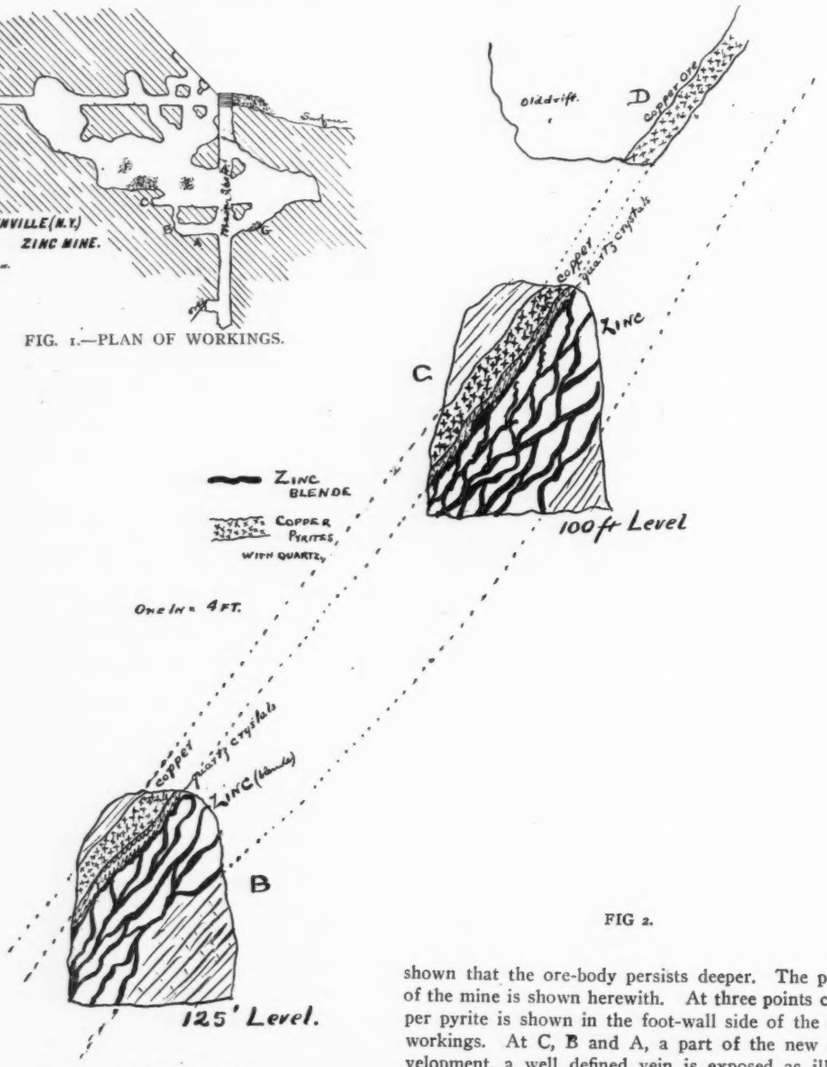


FIG. 1.—PLAN OF WORKINGS.



ELLENVILLE ZINC MINE.

The chief developments in this formation have been at Guymard, only a few miles from Port Jervis, at Wurtsboro and at Ellenville. In all of these developments the lead found so abundantly on the surface was displaced by a zinc blende, as depth was gained, and, in the case of the Ellenville mine, by zinc blende associated with copper pyrite.

The Shawangunk grit, in which all of these mines have been opened, has a strike about NE.-SW., and dips about 40° NW. It is a dark gray quartzite, fine grained and very tough, and occurs in layers 6 to 15 ins. thick. The Guymard mine has been extensively developed. The vein is 4 to 5 ft. wide; it has been followed 250 ft. in depth and several hundred feet in length. Work was discontinued during the period of depression several years ago. At Wurtsboro, much lead was mined, but no extensive developments have been carried on in depth.

At Ellenville, active operations are now being carried on by the Ellenville Zinc Company. Several distinct veins appear to cut through the grit and are exposed at surface. The principal work is now being carried on from the 100-ft. level, on the main vein. Thirty years ago many tons of lead and zinc ore were shipped. The vein was supposed to be exhausted at the 100-ft. level, but the recent work has shown that the ore-body persists deeper. The plan of the mine is shown herewith. At three points copper pyrite is shown in the foot-wall side of the old workings. At C, B and A, a part of the new development, a well defined vein is exposed as illustrated in Fig. 2. The ore-body has a dip of about 40° NE., and a pitch with the formation, 40° NW. On the hanging-wall the vein shows from 12 to 15 ins. of copper ore, copper pyrite in a quartz gangue, average samples assaying from 6 to 12 per cent copper. Zinc ore lies next to the foot-wall, and varies in width from 3½ to 5 ft. It is composed of streaks of pure blende, varying in thickness from 1 to 4 ins., forming a network through the quartz. Samples taken from this ore-body assay from 20 to 30 per cent zinc. The zinc and copper ore-bodies are separated by a narrow opening lined with quartz crystals, forming beautiful clusters; the copper pyrite is frequently seen in massive crystals among the smaller quartz crystals.

FIG 2.

The main shaft is now being continued, and within the past few days has opened up, at the 175-ft. level, a large body of zinc and copper ore. It is intended to continue this shaft, and in the meantime arrangements are being made to erect a concentrating mill. It is expected that this mill will be ready for work by August next.

PROGRESS IN THE METALLURGY OF NICKEL DURING 1902.

By Titus Ulke.

Developments at Sault Ste. Marie, Ontario.—During 1902 the commercial impracticability was demonstrated of cheaply roasting Sudbury pyrrhotite nickel ores, which do not average over 25 per cent sulphur, in Herreshoff furnaces in order to utilize the sulphurous acid gas thus obtained to make sulphite pulp or liquid acid (as attempted by Mr. Sjoestedt). The use of the dead roasted residue in the making of ferro-nickel was also found to be commercially unsuccessful. It is recognized that unless this roasting in the Herreshoff furnace can be done mainly without the aid of extraneous heat, the cost compared with heap-roasting, is prohibitive, and in any case the average percentage of sulphurous acid in the gas produced is too low to be economical for use in the manufacture of bisulphite of lime for making sulphite pulp.

The roasted nickel ore produced at Sault Ste. Marie was briquetted during 1902, but was not used in the way originally planned by Messrs. Clergue and Sjoestedt; that is, for making ferro-nickel in electrical furnaces, probably because its copper and residual sulphur contents were too high to yield a satisfactory product. It is evident that ferro-nickel made in this way would be too costly and too cupriferous for use in making nickel-steel commercially.

Later the Lake Superior Company proposed the treatment of pure nickel ore, that is, ore containing nickel without copper, although it appears that no such ores, in paying quantities, have yet been discovered in the Sudbury District. Furthermore, any "hand-picking" process of freeing the nickel ore from copper and phosphorus, which is chiefly contained in the gangue, in order to get these elements low enough to make good pig iron and steel, is impracticable.

Plans and estimates have been prepared, and it is reported, requests for tenders have recently been made, for a large custom nickel and copper smelting and refining works to be erected at Sault Ste. Marie. The site for the plant, whether on the American or on the Canadian side, has not yet been decided upon although its location in Ontario seems probable, owing to a provision of the Canadian tariff relating to the refining of nickel. The plant, as designed, is of a daily capacity of 75 tons of electro-copper, 7.5 tons of electro-nickel, and from 2,000 to 5,000 oz. (in fine bars) of precious metals. The process of treatment is as follows: Crude nickeliferous copper anodes, averaging from 80 to 90 per cent Cu., from 8 to 9 per cent Ni. and a few ounces of silver, gold, platinum and palladium per ton, are to be obtained by treatment of Sudbury matte, together with straight copper matte, or with silver-bearing copper concentrates, such as the argentiferous 70 to 80 per cent Cu. mineral recovered in the Quincy, Isle Royal, Osceola and other stamp mills of the Upper Peninsula, purchased outright by the smelter or refined on toll. These anodes are to be electrolyzed just as in modern copper refining, and the process of depositing fine copper carried on in exactly the same way, excepting for the continuous withdrawal of a small amount of the electrolyte, and its replacement by solution free from nickel, in order to prevent the enrichment of the electrolyte in nickel sulphate beyond the standard adopted. The withdrawn acid solution is then sent to the separating works, where simple and well-known chemical means are used to remove the copper and iron, and a neutral solution of nickel sulphate, now free from copper and iron, is obtained. This solution is to be evaporated to dryness and the double salt obtained calcined, so as to recover ammonium sulphate from which ammonia for neutralizing the acid solution can be obtained by distillation with lime and steam. The nickel sulphate is to be reduced until sem-metallic nickel, or at least semi-coherent black nickel oxide is secured. This is then to be placed in a frame, similar to the one patented in 1898, by Mr. F. A. Thum, and used as an anode. Each nickel depositing tank should contain a sufficiently large number

of such anodes, and a hot neutral solution of nickel sulphate, from which compact deposits of pure nickel of any required thickness can be secured.

By the use of a soluble anode of this character instead of an insoluble anode of lead or graphite, the cost of refining is considerably reduced, as polarization is diminished and a lesser voltage is needed.

The power required for the refining plant, between 3,400 and 4,000 h.p., is to be furnished in the shape of a three-phase alternating current of 10,300 volts, delivered to the high tension switchboard of the refinery power house, at a total estimated yearly cost or price of $12.50 per metered electrical horse-power at the generating station.

The works are to be located on a site having facilities for shipping both by rail and water, flat in topography, and at least 12 acres in extent. They are designed to allow the erection of a limited or unit-section of the works, and so arranged that future extensions in at least two directions may be made by a simple duplication of the first section.

Developments in the Sudbury District.—The Mond smelting and converting plant at Victoria Station, Ontario, closed down recently, in order to make changes in the method of smelting, with a view to the use of hot blast and possibly pyritic smelting.

The experimental plant erected at Worthington station for the Nickel-Copper Company, of Hamilton, Ontario, to treat the ores of its mines by a new self-roasting process, has proved a failure, due chiefly to the low rates of concentration effected and insufficient heat generated by the process itself.

During the early part of 1902, the Canadian Copper Company operated 11 or 12 smelting furnaces in its two works at Copper Cliff, which has a capacity for smelting of at least 1,400 tons of Sudbury ore daily. At present only four or five of these furnaces are kept running by the company. Its electrolytic refinery, near Cleveland, shut down several months ago.

The Orford Copper Company is now enlarging its two Brown straight-line roasting furnaces near Copper Cliff, and is also putting in a new one.

The Lake Superior Power Company's two smelting furnaces at the Gertrude Mine, 12 miles from Sudbury, were started during the summer and fall of 1902, and have already produced matte of the estimated value of over $200,000.

Mond's Refinery at Clydach, Wales.—Mond's process of nickel refining, as applied at the Clydach Works, Swansea Valley, Wales, is carried out, according to *Stahl und Eisen*, 1902, XXII, 1082, as follows: The bessemerized Sudbury matte is dead roasted and treated with dilute sulphuric acid, whereby about 66 per cent of the copper and not over 2 per cent of the nickel are extracted. The residue, after drying, assays from 45 to 60 per cent Ni. It is treated in charges of 500 kgs. with water gas in a reduction tower at a temperature of not to exceed 300° C. The tower is 7.5 m. high, and contains 14 hollow shelves, which are heated with water gas to 250° C. The ore is moved from shelf to shelf by means of rakes operated by a vertical axle. The lowest shelves are cooled. The reduced charge is transferred to a similar tower called the volatilizer, in which the metal is treated with carbon monoxide at a temperature not exceeding 100° C. The residue from the volatilizing tower is returned to the reducing tower, and the charge goes back and forth between the two towers for from 8 to 15 days. When 60 per cent of the nickel has been volatilized as nickel carbonyl, the residue is returned to the roasting furnace. The nickel carbonyl is treated in the decomposing apparatus, wherein the nickel is recovered as granules assaying from 99.4 to 99.8 per cent Ni. Reports indicate that Mond's volatilization process, although ingenuously worked out, in its practical application developed several weak features, and as incomplete extraction at several stages of the operation making it necessary to hold back considerable nickeliferous material in process for re-treatment; danger of explosion; losses in nickel, and poisoning from leakage of CO gas, all of which seem to militate against the commercial success of Mond's process.

Developments in Germany.—The electrolytic works of the Allgemeine Elektro-Metallurgische Gesellschaft, at Papenburg-a.-d.-Ems., are reported as producing a small output of copper and nickel, according to a modified Hoepfner process, using a chloride solution. The capacity of the works is one ton of refined copper and nickel daily, although the actual output is only a small fraction of a ton. The following process is said to be in use:

The ores and matte received at the works are leached with a cupric chloride solution, in order to dissolve the copper, nickel and silver contents, and simultaneously reduce the cupric salt to the cuprous state. After purification, and freeing from silver, the solution is passed into electrolytic cells provided with carbon anodes and copper cathodes. Chlorine is liberated at the anodes and utilized, about half of the copper in the electrolyte is recovered by electrodeposition, and the cupric solution remaining after electrolysis is withdrawn and reused in leaching a fresh charge of ore or matte, until it is found desirable to recover the nickel in the solution. This is done electrolytically, after first removing the copper in the acid solution, probably by electrodeposition with lead anodes in so-called "finishing" tanks. Very recent reports indicate that the Papenburg concern has not been eminently successful, and that the entire plant is to be remodeled.

Prof. W. Borchers finds that sulphide ores of nickel can be leached by an improved process, analogous to the Siemens & Halske ferric sulphate method, both cheaply and with a high percentage of extraction, and is testing the practicability of this new method, which embraces the electrodeposition of the nickel, in the treatment of low-grade ores containing nickeliferous sulphides.

Borchers and Gunther propose (*Zeitschrift fur Elektrochemie*, VIII, xxxxix, 747, September 25, 1902) to smelt nickel-copper sulphide ore to a matte in the ordinary manner and then to reduce the matte to a nickel-copper alloy. The latter is to be electrolyzed in an acid solution of copper sulphate, according to Andre's method, yielding electrolytic copper, an anode slime consisting of Cu_2S, Cu_2O and the precious metals, and a solution of nickel sulphate. The latter is to be freed from cobalt and small quantities of iron by known methods (in the case of large quantity of iron by crystallization as described in *Jahrbuch der Elektrochemie*, IV, 305) and then electrolyzed hot, with lead anodes, in solutions of alkali salts, of which the anion will form soluble salts with the anode metal, whereby products which can be worked up into white lead, chrome yellow, etc., will be obtained at the anode and pure nickel at the cathode. This is conceived to offer advantages over the American method of tops and bottoms smelting.

The blast furnace erected near Frankenstein, Silesia, for treating the nickel ores of the neighboring Martha and Benno mines at present has a capacity for smelting 25 tons of ore daily, but is to be enlarged soon. The crushing mill and blowing engine for the smelter are supplied with power from two steam engines, one of 120 h.p. and the other 75 h.p. The production started in 1899 when 80 tons of nickel ore were treated, and rose to nearly 4,000 tons in 1900, valued at about $20,000.

Magnetic Behavior of Nickel Alloys.—Prof. Barret and Dr. Brown find that 2.5 per cent Ni. in iron hardly affects the magnetic quality, and 5 per cent Mn. in steel leaves a strongly magnetic material; but 2.5 per cent Ni. plus 5 per cent Mn. in steel, makes the latter non-magnetic.

Perron's Process of Treating Copper-Nickel Ores.—C. Perron, of Rome, Italy, patented a lixiviation process (United States Patent No. 709,277) for poor copper-nickel ores, consisting in the treatment of the said ores in crude or natural condition with ammonium sulphide.

Haas' Process of Melting Nickel.—H. L. Haas, of New York, has patented (United States patent No. 709,218) a continuous process of melting and refining nickel containing carbon, consisting in subjecting a column of a mixture of nickel in granular form directly with fuel to heat generated from soid fuel; passing large quantities of air under excessive pressure upwardly through the entire column of nickel and fuel, to insure a temperature above the melting point of nickel, and to oxidize the carbon in the nickel; allowing the melting nickel to flow downwardly through the mass, and in contact with the air, drawing off the melted nickel with more or less continuity below the column, and supplying fuel and granular nickel as necessary to the top of the column to maintain the temperature and to continue the process.

Browne's Process for the Electrolytic Separation of Copper and Nickel.—As described in United States patent No. 714,861, this process consists in first treating copper-nickel matte to form copper-nickel alloy substantially free from sulphur, and then treating said alloy with chloride and a solvent for cuprous chloride.

The History and Present Development of Electrolytic Nickel Refining is discussed at length in the February, 1903, issue of the *Electrochemical Industry*. Therein I briefly describe the Vivian, Balbach, Cleveland, Hamilton and the Papenburg electrolytic nickel refineries and the proposed copper and nickel refinery at Sault Ste. Marie. The data given include many facts published for the first time concerning the Vivian and the Balbach plants and the conditions governing profitable refining.

The Vivian electrolytic nickel-copper separating works were erected at Swansea, Wales, in 1892, and were designed to treat about 10 tons per week of a nickel-copper alloy produced from Sudbury matte. The various difficulties encountered in operating these works, and the methods adopted for overcoming some of these troubles are discussed in detail.

The Balbach electrolytic nickel refinery was built in 1894 and operated until 1900, during which time about 1,000 tons of electrolytic nickel were produced. With every horse-power of current, averaging between 1.7 and 1.8 volts and 15 amperes per sq. ft. of cathode surface, in 365 days, between 2 and 4 tons of nickel were deposited out of a hot neutral solution of nickel sulphate. From crude nickel anodes, assaying between 94 and 97 per cent N., a remarkably pure and strong electro-nickel, containing not more than 0.25 per cent Fe, and practically free from carbon, silicon and sulphur, was obtained. The main drawback of the process adopted was the large amount of scrap produced from the imperfectly smelted and very brittle anodes. It was subsequently found that this difficulty could be obviated, or at least considerably diminished, either by using an anode frame (such as is patented by Mr. F. A. Thum), in which metallic or semi-metallic granules, scrap or powder (easily secured by reducing nickel oxide) is used instead of the more expensive cast anodes, or by connecting slabs of crude nickel, serving as electrodes, in series circuit, as suggested by Mr. William Thum, so that the nickel deposited on the cathode side would make a staunch backing for the crumbling crude nickel of the anode side, besides obviating the need of anode suspension and contact lugs. It is claimed that electrolytic nickel cathodes can be produced from Orford anodes in this way at a cost of less than 1 cent per pound.

Besides metallic nickel, the metallurgists of the Balbach Smelting and Refining Company, who were the pioneers in the commercial electrolytic refining of nickel as well as of copper in America, have for many years been producing nickel plater's salts. The Balbach method of recovering nickel sulphate consists chiefly in repeated fractional crystallizations and a final removal of the remaining copper by electrolysis.

Nickel-Steel Rails.—The results of tests made by the Pennsylvania Railroad with nickel-steel rails at points where the wear is unusually heavy appear to have been favorable, for orders were

recently placed for 9,000 tons, the steel to carry 3.5 per cent nickel. Although the price for such rails is very nearly double that ot ordinary steel rails, it is believed that their extraordinary toughness and hardness will repay the extra cost. The nickel used in making the rails is metallic nickel, and according to reports, is added in the converter.

DEVELOPMENT IN THE NICKEL INDUSTRY AT SAULT STE. MARIE, ONTARIO, CANADA.

By E. A. Sjöstedt.

During 1902 the economical practicability of roasting Sudbury nickeliferous pyrrhotites with the utilization of the evolved sulphur dioxide (SO_2) gas for the making of a sufficiently strong sulphite liquor for pulp making, and for the manufacture of liquid sulphurous anhydride was demonstrated in a most gratifying manner—and is now being accomplished in roasters, designed and patented by the writer, without extraneous heat, the gas delivered to the sulphite mill being of ample strength for producing a bi-sulphite of lime and magnesia solution suitable for the manufacture of sulphite pulp. The nickel ore roasted during 1902 was not used for making ferro-nickel in the electric furnace as was at one time intended, not because of any disappointment with this method, but the success attained in dead-roasting the ore encouraged the belief that the reduction of the metals could be accomplished on a large scale earlier and somewhat more economically in the blast furnace process. For this reason the cinders are now briquetted, ready to go to the blast furnaces, one of which is nearly completed, there to be mixed with a non-nickeliferous iron ore in such proportion as to produce a pig of desired nickel content, which is to be treated subsequently by the bessemer or open-hearth process for the manufacture of nickel steel. The ore intended for the roasting and ferro-nickel process is selected with the view of obtaining a minimum amount of copper and gangue, accomplished mostly in the mine, and by sorting at the crusher on the picking tables, the resultant ore averaging about 3 per cent nickel, from 0.2 per cent to 1 per cent copper, from 25 to 30 per cent sulphur and 0.01 per cent phosphorus.

With the experience of a number of unsuccessful attempts before him, and encouraged only by the fact that "it was not theoretically impossible," it was a bold decision Mr. Clergue made when directing me "to try again," not only to use a mono-sulphide instead of a bi-sulphide ore (which eminent men in the profession had termed "one of the most serious errors ever perpetrated in the manufacture of acid"), but also to dead-roast the same and make it a suitable raw material for the ferro-nickel industry, thereby utilizing not only the nickel in the ore, but the sulphur and iron as well.

Success was not attained at once, but by perseverance the question has been solved in a most satisfactory manner, and gas is now being produced at a considerably less cost than was at first expected, as may be seen from the daily records during two weeks in February last, while roasting pyrrhotite exclusively and without any extraneous heat:

Composition of the ore used, average samples taken from each 40-ton lot.

	a	b	c	d	e	Av'ge %
Insoluble	24.74	29.20	24.95	21.03	16.10	22.5
Sulphur	26.30	23.81	24.67	27.60	29.91	24.46
Copper	0.33	0.78	1.30	1.25	0.91	0.91
Nickel	3.93	3.30	3.40	3.53	4.12	3.43

Results (average of tests made every hour):

February	11	12	13	14	15	16
Gas, % SO_2	8.6	8.6	8.5	8.1	8.0	7.8
Cinder, % S	1.32	1.99	1.05	2.67	2.02	2.05

17	18	19	20	21	22	23	24
7.8	8.0	7.4	7.4	7.6	7.6	7.4	8.0
..	2.54	1.83	1.73	0.95	..	1.86	..

During this time 210 tons of pyrrhotite were roasted, containing 111,132 lb. sulphur, and the absorption at the sulphite mill during the time being 191,917 lb. SO_2, corresponding to 95,958 lb. sulphur, showing a loss of 15,174 lb. (13.6 per cent) sulphur in roasting and absorption. The average working cost during these two weeks (not counting the expense of heating and lighting the building) was less than $2 per ton, divided as follows:

Labor	$1.12	Crushing	$0.50
Power	0.24	Roasting	0.75
Repairs & Sundries..	0.50	Supt. Repairs & Sun.	0.61
Total	$1.86		$1.86
1 Ton Pyrrhotite....	5.00		5.00
	$6.86		$6.86

The amount of SO_2 gas utilized at the sulphite mill was 914 lb. (0.457 short tons) per ton ore. By charging the ore to the cost of the gas this would be equivalent to $15.04 per ton SO_2 delivered at sulphite mill, or $30.08 per ton sulphur. Assuming now the value of sulphur to be only $25 (that is, SO_2 at $12.50) per ton, the cinders would then cost us ($15.04 minus $12.50) $1.54 per ton, to which we will add an ample amount for cost of briquetting, depreciation of plant, insurance, etc., say, $1.46, making the cost of the briquetted cinder $3 per ton; yet the briquettes would thus cost us $2 less than the raw ore used. When running the plant at its full capacity (40 tons per day) these figures would be materially decreased. It is, therefore, evident that even should the ferro-nickel made from the briquettes be "too costly and too cupriferous for use in making nickel steel commercially," nothing would prevent their use profitably in the copper-nickel furnaces for making matte, having obtained them, after extracting and utilizing the sulphur, at less cost than charged to the smelter for ordinary raw or heap roasted ore.

The liquefaction plant is in perfect running order, but owing to lack of sufficient orders it was operated only experimentally during four days in June, producing 4,000 lb. liquid SO_2, and again during 24 hours in September when 5,000 lb. were made. Of the acid made, sample cylinders have been sent out on the market for which 5c. per lb. were received. The capacity of the plant is 15 tons of liquid sulphurous anhydride per day, which can be produced at a cost below $25 per ton.

No trouble has been anticipated from "the use of dead-roasted residue in the making of ferro-nickel," nor has any uneasiness been felt concerning the ability "to get copper and phosphorus low enough in the roasted ore to make a good pig iron or steel," but, realizing the evil effect of sulphur in the metal produced, it is our endeavor to attain a *perfectly* dead roast. The quantity of sulphur in the briquettes, however, will practically be divided by three when aiming at a pig iron of about 2 per cent nickel, by mixing the briquettes with double the quantity of iron ore free from sulphur in the blast furnace, when whatever sulphur remains will be fluxed off by using a basic slag (lime and manganese).

With regard to the dangerous influence of copper in steel, well informed metallurgists have recently shown it to have been greatly exaggerated (see experiments by Colby & Lippin, also by Stead & Evans in their report at the Iron and Steel Institute meeting, 1901). These active workers state that "Copper has no more right to have the character of making steel red short than has carbon"; that "copper, instead of producing red shortness, has the contrary effect of changing red short steel into steel which will roll without cracking"; that "between 0.5 and 1.3 per cent copper has no deleterious effect on either the hot or cold property of steel"; that "in small quantities copper slightly raises the tenacity and the elastic limit, but unlike phosphorus, it does not sensibly make the steel liable to fracture under sudden shock"; but that "when present in large quantities (2 per cent and above) copper makes the steel more liable to be overheated, and, like carbon, reduces the power of the steel to extend under stress."

In conclusion, I wish to point out the great importance of the results obtained at Sault Ste. Marie in the roasting of mono-sulphides without the aid of auxiliary heat, at a price which will make many sulphide deposits, heretofore considered valueless, of economic value and importance as a raw material for a sulphurous and sulphuric acid industry. I do not contend that sulphur or pyrite is a less valuable or desirable raw material for the manufacture of these acids, but that having the former at hand and not the latter, a mono-sulphide, with or without nickel content, may be used to produce SO_2 in liquid or gaseous form more economically than the cost to manufacture it from imported sulphur or imported pyrite.

ORIGIN OF PEBBLE-COVERED PLAINS IN DESERT REGION.*

By William P. Blake.

The attention of travelers, upon the desert bordering the Great Colorado of the West, is often arrested by broad stretches of pebble-covered plains, or mesas, glittering in the sunlight from the myriads of polished surfaces, giving, at a distance, the appearance of a sheet of water. It is not alone the well-rounded, polished surface of these pebbles which commands attention, but, in addition, their nearly black or dark-brown color; and, above all, their uniform distribution in a level sheet, covering the plain in a continuous layer or pavement like a vast mosaic without sand or soil. Hundreds of square miles along the lower Colorado, especially in Yuma County, Arizona, and on the borders of the Colorado Desert in California, are thus covered. It is evident that the former extent of such pebbly plains was much greater than now, for the continuity of the mesa is broken into by the numerous dry arroyos or washes formed during exceptional showers or deluging rains.

In some places there is an underlying bed of pebbly conglomerate, a mixture of pebbles and sand; in others the pebbles rest on a sandy, earthy foundation. The rounded pebbles are distinctly alluvial in origin, and pertain to the ancient Colorado drainage system; but it is not comprehensible that such regular layers of polished pebbles could have been left by subsiding floods or river action.

Attention was early directed by me to these remarkable plains, first examined in 1853, when exploring for the United States and seeking a practicable route for a railroad to the Pacific Coast.[1] The cut and polished surface of the pebbles and of loose rocks on the desert was then correctly explained as due to the attrition by wind-driven sand and dust, but an explanation of the pavement-like surface and the accumulation of pebbles and rock fragments in close contiguity was not attempted.

The object of this paper is to offer an explanation and to add to our knowledge of the phenomena of æolian denudation.

It appears certain that the surface-sheet of pebbles, and in many localities of small fragments of rock and bits of fossil silicified wood, is the result of an accumulation by the gradual removal, by the wind, of sand, silt or finer materials from around and below the pebbles, undermining them, removing their support, and permitting them to fall to a lower level, where they accumulate by concentration until the whole surface is closely covered by fragments too large and heavy to be moved away by the wind. Such a deposit of pebbles or fragments may thus represent all that were originally distributed through several feet of thickness of sand and lighter alluvions. In this way there may be a removal of a large amount of fine materials from the general surface of a region, lowering its level, until, by the complete covering and protection of the surface by the concentration of the heavier fragments, æolian denudation is arrested, and the further lowering of the surface is stopped.

* Paper read before the American Institute of Mining Engineers, February, 1903.

[1] "Report of a Geological Reconnaissance in California." Vol. v, *Pacific Railroad Reports*, pp. 108, 112, 117.

MINER'S PHTHISIS AND DUST IN MINES.*

By William Cullen.

The two conditions under which a miner can get an overdose of dust are: First, working dry holes with the rock drill; second, entering a working before the dust produced by the blast has had time to settle.

Assuming that these are the primary causes of miner's phthisis, it becomes evident that the remedy for such unhealthy conditions belongs to the realm of mechanical engineering, and already there are indications that the problem is about to be solved. Of course, the dust problem has been recognized for many years, and long before the appointment of the commission at present taking evidence on the subject, attempts had been made to reduce the inhalation of dust by means of masks, atomizers and sprays. We all know, however, how perverse human nature is—how familiarity breeds contempt—and unless a miner can be provided with a device which does not put him to any inconvenience, he will never go out of his way to use it, unless the non-compliance with regulations regarding its use be made a criminal offence. I would point out that it is a problem whether it is not better from a health point of view to inhale the dust and work under comparatively dry conditions, than to trap the dust and work in sopping wet clothes, with all the other attendant risks. At any rate, this is a subject worth discussing. I do not know whether any of you have ever worn a mask for any length of time or not, but even with the best of them the feeling of stuffiness and general discomfort becomes eventually almost unbearable.

In certain industries, legislation has made it compulsory for the work-people to wear masks, but for the reason just referred to, and incidentally to the want of common sense in the design, it is generally the case that the workman seeks by every means to avoid having to wear them. Masks will, therefore, I am afraid, never be popular, but as a preventive against the inhalation of dust they are undoubtedly efficacious. It has also been contended, with plenty of reason, that the atmosphere in which the miner works has a great deal to do with his health. Indeed there is no getting away from this fact, as also that in some places such as blind drives, raises and winzes, the ventilation is none of the best, and that it would be unhealthy for any person to work in them. I merely mention and emphasize this matter to point out that it can have no possible connection with miner's phthisis as a specific trouble. Of course, continuous working in a bad atmosphere will make any person physically unfit, and therefore pre-dispose him to all sorts of trouble. I have no doubt whatever that this condition of things will be remedied even before legislation compels the mining companies to do more than they are doing now, but the obvious solution of the question is to improve the ventilation, and carry air pipes wherever possible. This is already being recognized, and in the long run it will pay to devote more attention to the matter. There is still another possibility that even with this improved ventilation the gases exuded by the rock itself, or from fissures, is sufficient to make the atmosphere bad.

There is no earthly reason why a miner should not wear a mask, the interior of which is continually supplied with a current of cool air direct from the air pipe working the drill. This has been proposed by Dr. Amyard, and although it can only have a very limited application, one can imagine circumstances under which it would be extremely beneficial. Of course, such an arrangement must minimize the stuffy feeling already referred to, and if a light rubber tube were made the connecting medium one can conceive that the inconvenience involved in its use would be very little indeed. The object of such an arrangement would be two-fold. Firstly, to catch dust; secondly, to supply the miner with fresh cool air.

The inconveniences of the arrangement are very obvious, the principal one being that it could only be really efficacious when a man, say, a machine man, was working at his specified place. It would be no use if he had to move about. Another question is raised here, is the air supply from the compressors really purer than the air of the mine after all? This looks almost like begging the question, seeing the compressors are primarily erected for helping and improving the ventilation, but it is undoubted that even under the best conditions, considerable quantities of oil are carried to inconceivable distances. From personal experience, I know that it is a very difficult thing to prevent this, and no system of trapping can obviate it altogether. But it can be reduced to a minimum, and in saying this, I am merely repeating what is perfectly well known to all of you. One obvious precaution is to employ only good cylinder oil, having a very high flash point. When there are even large quantities of oil in the compressed air, it has yet to be proved that it does any permanent harm, but if the oil has ignited, one can imagine that some of the gases produced would be the reverse of helpful.

One other point, and one which has a more direct bearing on the subject proper, is the dust itself. Have any of you ever examined the dust under the microscope? If you have, you will readily understand how dust can be so dangerous. It is merely a mass of knife edges, rough saws and every other shape, except that of round pebbles—a ghastly-looking collection.

I have already referred to the unhealthy conditions under which the miner works, and these are generally recognized. In wet workings a man cannot help getting wet, and if he does not change immediately he comes to the surface, in fact, if he does not exercise the precautions which you and I would exercise, he is bound, sooner or later, to contract some pulmonary trouble. There are, of course, men who can stand any amount of this sort of thing, and among the colliers in the part of England which I hail from, the mortality is not particularly high, although most of the mines are wet. This merely shows, however, that the dust which the miner inhales here is more harmful than coal dust, but this is generally recognized. Legislation and proper supervision can easily remedy this part of the problem, but it can never prevent a man having to work all day in sopping clothes and wet feet. This again can have nothing to do with miner's phthisis as a specific trouble.

The great rival to the dust theory is that of the noxious gases, and we hear people say repeatedly, "Well, they may talk as they like about dust, but I believe that the explosive we use has more to do with the thing than everything else put together." Others, again, not quite so positive, affirm that it is their conviction that the gases have quite as much to do with the trouble as the dust, and there are many shades of opinion between these two extremes. Fortunately, it is not necessary for me to say much about the nature of the gases produced by the explosives in use on these fields, and the matter is not complicated by the use of more than one class of explosive. Blasting gelatine, as you all know, is an easy first, and when treated properly, and when of good quality, produces no noxious gases whatever. This is a statement which is absolutely incontrovertible. But we must admit that in practice the ideal state of things does not always obtain, and that gases are very frequently produced which are harmful. Let us see for a moment what could possibly happen in the worse possible circumstances. The only really harmful gases which could be produced are carbon monoxide, carbon dioxide and nitrogen oxides—i. e., of course, from the explosive. But, in addition to this, there are the gases formed from the combustion of the fuse, and it must be at once admitted that they manifest their presence through a most pronounced smell and smoke. Carbon monoxide and dioxide as well as sulphurous acid and sulphuretted hydrogen (the latter in small quantity) are all produced, as chemical analysis show, but although the latter two have very characteristic odors, they are seldom, if ever, recognized by their smell. Sulphuretted hydrogen is a most deadly gas to inhale, and I should say that it is the only one out of the four mentioned which could cause any inconvenience. But has any one of them any connection with miner's phthisis? I do not believe it for a single moment, but to say that the constant breathing of the fumes from the burning of fuse is good for a miner, or for miner's phthisis, I also do not believe. The amount of smoke produced is very alarming looking in appearance, and an atmosphere charged with it is very unpleasant to breathe, causing a catching sensation in the back of the throat, and in the chest, but this rapidly goes away. We see, therefore, that the worst which can be said about the fuse gases is that they are unpleasant and possibly unhealthy, but we find it difficult to accuse them of being anything worse.

There are other and minor possibilities, which may be dismissed in a word. Firstly, the presence of vapor of mercury (from the detonator) in the atmosphere. At the most this can only amount to 1 gramme fulminate for each charge, so it may be dismissed as out of court. Secondly, the occasional presence of nitro-glycerine as vapor in the atmosphere. It is possible for this to happen, but although the breathing of nitro-glycerine vapors cause most violent headaches, and general inconvenience, the accepted theory is that they are more beneficial than otherwise, and judging by the health statistics of those who have to inhale them daily, one can safely say that by themselves they are absolutely innocuous. We are therefore driven back to the last line of attack, the noxious gases produced from the explosives themselves; and it may be advisable to consider them by the processes of analogy and elimination. I have already said that the only three which need be considered are carbon dioxide—i. e., carbonic acid, carbon monoxide, and the oxides of nitrogen. Now none of them are good, and the mixture is decidedly bad, as is evidenced by the fact of men and boys getting gassed, and that sometimes very badly. In the coal mines in England, and indeed all the world over, black powder was used exclusively until very recently. It produces on explosion large amounts of carbon monoxide and dioxide as well as sulphurous acid, yet we never have heard of miner's phthisis among coal miners. They suffer, as all of us do, from the effects of damp, and they occasionally get an overdose of gas, but now-a-days, since the regulations for blasting have become more stringent, and are being more strictly enforced, we seldom hear even of this. I say, and even assert, that carbon monoxide and carbon dioxide, can have no possible connection with miner's phthisis as a specific disease. Carbon dioxide will suffocate the strongest man, and carbon monoxide will cause death through combination with the haemoglobein of the blood, thus excluding the free absorption of oxygen, but the action of these two gases on human lungs has been so thoroughly investigated that we cannot help coming to any other conclusion than that just given. And now I come to the last gas of all, which for the sake of simplicity I shall call nitrogen peroxide. There is no doubt but that this gas has most harmful effects on the human system, and I speak from experience, not in mining but in chemical industry, where we come across it very frequently. I have known a great many cases where men have inhaled what seemed to be small quantities of this gas, but in less than two days they were dead. In one or two cases they died within 24 hours, and the symptoms in nearly every case were the same. At first, the man felt pretty well, and was able to eat all right, but the collapse came with fearful suddenness, the symptoms at the end being invariably what doctors call bronchial pneumonia. What makes these cases so dif-

* Abstract of a paper read before the Chemical, Metallurgical and Mining Society of South Africa, February 21, 1903.

ficult to deal with is the fact that the man always feels quite well for some time, and generally asserts that there is nothing wrong with him. Quite recently I had four such cases to deal with in one day, and I ascribe their being alive and well now to the fact that from the first I insisted upon treating them as patients. It is not the object of the paper to go into the scientific reasons for this action of nitrogen peroxide, and I content myself with stating these facts. This much I must, however, say in addition—if a man is at all weakly, and if he has any symptoms of pneumonia on him, he will be attacked very readily by nitric peroxide. If he is badly gassed, he will likely die. You will see, therefore, that this is bringing us a little nearer to the specific disease, and as I have no intention of falling out with medical opinion, I prefer to leave the matter at this stage.

In discussing the question of the laying of dust, I indicated the lines on which the investigations ought to run, and, at the same time, pointed out the limitation of some of the devices. I shall therefore now consider the gases from the same standpoint, but I would emphasize a fact, that when nitric peroxide is produced, it is the result of an abnormal shot or bad explosive, or one of the various causes due to misfires. The next question is, can this be prevented to any extent by legislation? Most undoubtedly it can. Legislation could do much to insist on one definite method of charging a hole, and if good detonators, and above all good fuse, were employed, we should hear very much less about gassing with all its baneful results.

When on the subject of fuse, I referred to the gases and smoke produced, and if they are proved to be harmful, the obvious course to follow is to blast by electricity. I know this procedure is more expensive, and it demands more care on the part of the shot-firer, but in the English coal mines no other kind of blasting is permitted. I am not sufficiently practical to say how it would work on the Rand, but it is a subject worth very serious consideration, and to give a start to the discussion, I make this statement, that only shot-firing by electricity should be allowed in shaft sinking.

Another very great advantage which this system would have is that it would not matter in the least whether the detonator be inserted up to the neck, or only half home, as we do with ordinary detonators. With a great deal of the fuse now in use spitting is very common, and fumes are very often caused through this.

Let us now suppose that electric blasting were in general use, and that we had only to deal with dust in suspension while drilling dry holes, and dust in suspension and the gas from the explosion after a blast. With the former I have dealt already; on the latter I shall now say a few words. I think no one will disagree with me when I say that the sooner the miner can get back to the face with comfort the more work will be done for the same money. I shall go further, and say that sprays, atomizers, and the like, all assist in laying the dust and damping the gases. It takes no great stretch of the imagination to think of some mechanical device connected with the air supply which the shot-firer turns on as he goes away from the face, and which can continue at work for as long as he likes after the blast has taken place. This spray will settle the dust, but in the case of a bad shot it can do little else, and if the ventilation is not good, noxious gases will hang about for a long time, and prevent the men returning to the face. Now, I understand that dilute caustic alkalies have been employed instead of water, and the idea is an excellent one, as it will assist in absorbing the large amount of carbonic acid formed. On carbon monoxide it has no action whatever, not even a solvent one—and no cheap solvent will ever be found to dissolve it. However, it certainly is not so harmful as the nitric peroxide by a long way, and I have proposed to use ammonia in addition to the alkali in order to neutralize any formed, and it does so very efficiently. A very dilute solution of ammonia serves the purpose very well, and although a 1 per cent solution has no smell, yet if sprayed through an atomizer, it soon fills the atmosphere with ammonia gas, which, besides doing as I have said, makes one feel quite refreshed.

I should also add that it is now possible to obtain electric time detonators. The great objection to electric shot-firing in these fields in the past has been that all the shots went off simultaneously. Now, it is possible to set them off at intervals of several seconds, which is a very decided advance on anything accomplished in the past.

CHAIN AND PICK COAL CUTTING MACHINES.

By H. S. Johnson.

When machine coal mining was first contemplated the inventor's idea, in the designing of a machine, was naturally to imitate as nearly as possible the operation of the pick miner; consequently, the pick or puncher machine, as it is commonly known, was the first type of mining machines tried. The defects of this form of machine soon became apparent, and the patent offices of both England and America were flooded with applications for patents on coal mining machines. The final result of this vast volume of inventions and patents has been the development of the present coal-cutter commonly known as the chain-breast machine, shown in Figs. 1 and 2. The pick or puncher machine had, however, been improved until it now does very satisfactory work under certain conditions.

FIG. 1—ELECTRIC CHAIN MINING MACHINE.

The purpose of both types of machine is to undercut the coal so that it can be shot down ready for loading into mine cars, but the method of operation of the two types is entirely different.

In operating a pick machine the runner sits on a board or platform, inclined to the face of the coal; one foot of the operator is braced against one wheel of the machine, and with the two handles he directs it against the coal, picking off the coal exactly as a miner would do, except with much more force to each blow. The undercut made is V-shaped, 12 to 16 ins. in height at the face, and tapering back to a feather-edge on the floor at the rear of the cut, the depth of the cut being from 3 to 6 ft., according to the thickness of the coal. A helper shovels away the cuttings as the machine guided by its operator, loosens the coal in the kerf.

FIG. 2—AIR CHAIN-MINING MACHINE.

The chain or breast machine is placed in position ready for the first cut at the extreme left of the room, the outer frame being held firmly in position by jacks extending to the roof. The runner then throws on his power, and the machine makes an undercut 44 ins. wide, 5 to 7 ft. deep (dependent upon thickness of vein), and 4 ins. high, in from three to four minutes. At the end of the cut the machine is thrown out of gear automatically, and is reversed so that the sliding frame comes back to its original position. (See machine in Fig. 3.) The machine is barred across the face of the coal the width of the cutter head and the operation repeated until the entire room is undercut. A helper shovels away the cuttings as they are brought out by the cutting chain.

The pick machine can be driven only by compressed air, as there has never been a successful electric puncher put on the market; whereas the chain machine can be operated either by compressed air or electricity.

During the last few years the major portion of the coal mines that have been equipped with modern coal mining machinery have installed electric power rather than the compressed air. Still, of course, there are a number of mines using the compressed air chain mining machines, either because they had a large installation of compressed air prior to the adaptation of electricity for mines, or because there is an excess of gases in the mines, which makes it seem unwise to adopt the electric power.

The disadvantages of compressed air in a mine are stated by the advocates of electric power as follows:

First.—Increased initial cost of installation as compared with electric equipment, it being about one-third greater for a small compressed air plant with the machines at no great distance from the compressor, while the proportion increasing very rapidly as the distance from power house increases.

Second.—An electric plant can be installed with a guaranteed efficiency of 75 per cent from the generator to the mining machine, while about 30 per cent would be an extremely high efficiency for an air mining plant, where no re-heaters are used.

Third.—An extension of an electric feeder line may be made in a very few minutes by the machine runner himself, if necessary, while the laying of additional pipe for compressed air for the necessary extensions is, under the most favorable conditions, a good deal of an undertaking.

Fourth.—The cost of maintaining a compressed air pipe-line is at least three times as great as an electric line. The acid water of mines is very severe on pipes, and after having once been put into a mine they can rarely ever be used again, and much loss and expense is incurred in maintaining pipe lines from leakage. On the contrary, with the copper circuits of the electric system there is scarcely any deterioration, and the wires can be readily removed and placed elsewhere in the mine when any portion of mine may have been worked out even after such wires have been in use for a number of years.

The only objection which has ever been raised against electricity for mine use is the danger of coming in contact with the wires. There have been some accidents in mines operated by electricity, but they are extremely rare. In the Kanawha and New River districts of West Virginia, for example, there are at the present time about 50 mines equipped throughout with electricity, and there is yet to be the first accident recorded which can be traced to any contact with the electric wires.

The advocates of compressed air claim that the air liberated from the compressed air engines in a mine

assists in ventilation. This is so, but the assistance is slight.

The initial cost of a chain machine is from three to four times greater than that of a pick machine. On the other hand, it requires the same number of men to operate each type of machine, a runner and a helper, and the pick machine will undercut only about 40 per cent as much coal as the chain machine. This fact has been recognized by the differential in the miners' scale of wages against the pick machine, which is 2½c. per ton, run-of-mine basis. In the face of the differential shown above, machine runners can always be more readily secured to operate the chain type of machine than the puncher, on account of their ability to make more money with easier work.

The lump coal is the coal on which the operator now makes the most money, and consequently a machine which gives him the greater percentage of lump is desirable machine. The pick machine making the same kind of an undercut that the miner does with a hand pick, gives very little more lump coal than the miner himself, whereas the chain machine increases the proportion of lump from 10 to 30 per cent, according to the character of the coal.

It is very much harder on a runner to operate a pick machine than a chain machine, as he is continually jarred by the action of the machine. The chain machine runner need not touch his machine after starting it until the cut is completed. It has been found much more difficult to educate a man in the proper handling of the pick machine than to operate a chain machine. With the pick machine a great deal of the result depends on the skill of the miner in directing the blows of the pick, while the chain machine, after once being set into position, does its work independent of any direction from the runner.

That there is a certain field for the pick machine, of course, cannot be contested. Where the coal is very thick and of a soft nature the pick machine does excellent work. It can undercut rapidly under these conditions, and the V-shaped cut is well adapted to let the coal come down; whereas in a mine having coal of this character there is danger of its settling down into the 4-in. kerf made by the chain machine and not rolling over when shot. In order to work a chain machine to the best advantage it is necessary to have a fairly good top, so that posts can be set 10 to 12 ft. from the face; a pick machine can be used unless such posts are required very frequently along face.

One claim made by the advocates of the pick machine is that it can be used in all parts of every mine, so that it is not necessary to have any pick miners. In all mines where chain machines can be used to advantage, which covers practically eight out of every ten mines, the chain machine can be used in every part of the mining save in the drawing of pillars.

The objection raised to having any pick miners in the mine is that it demoralizes the general working of the mine to have two systems and two rates of pay. Drawing pillars, however, is a very small part of mining, and is usually done by old and experienced miners, who consider it an easy snap, as coal on the squeeze is always easy to mine. This claim, therefore, need hardly be considered.

In a recent report the Chief Mine Inspector of Ohio says: "But while the machines depending upon electricity for power are becoming more popular and are more generally used, those operated by compressed air are becoming fewer. In 1899 the compressed air machines numbered 44; in 1898, 58; in 1897, 67; in 1896, 79; in 1895, 86; and in 1894, 112."

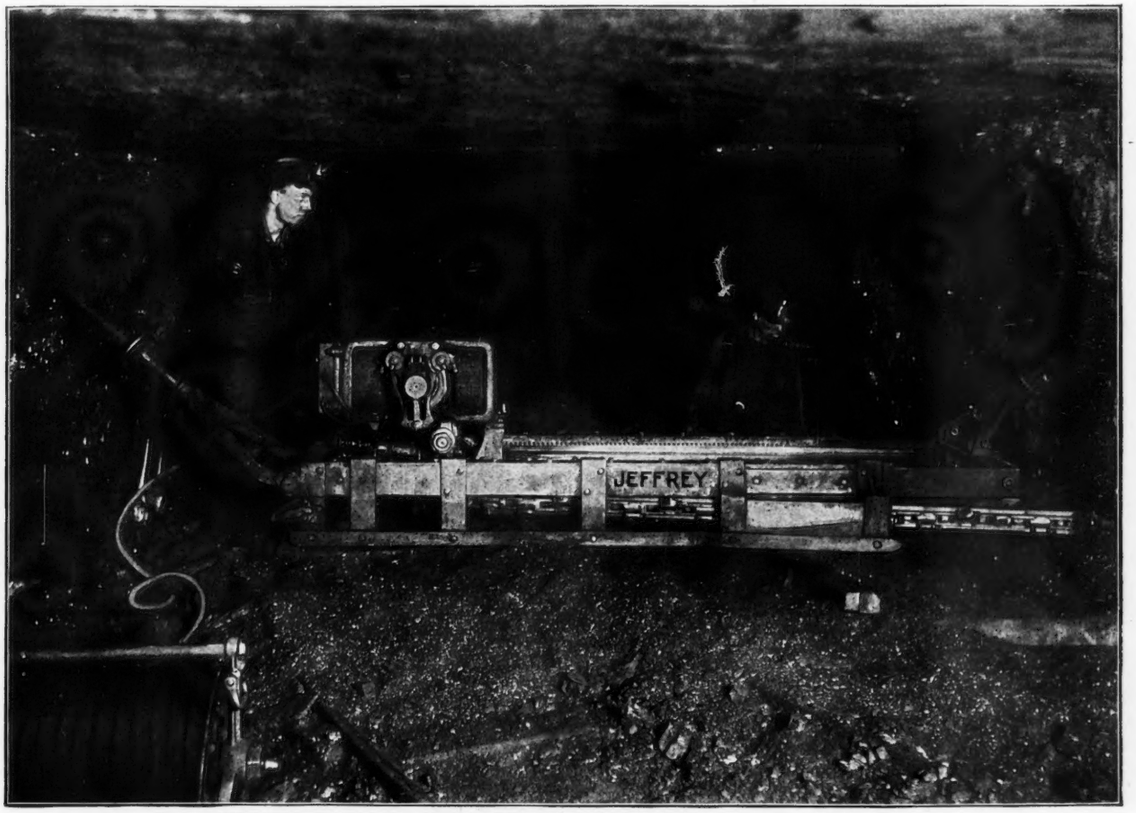


FIG. 3—ELECTRIC MINING MACHINE, IN POSITION TO MAKE FIRST CUT.

PROSPECTING FOR COAL IN INDIA.—The Geological Department of the Indian Government is preparing, according to *Indian Engineering*, a scheme for experimental borings in search of coal. Several coal-fields are to be thoroughly tested in this way.

MINERAL PRODUCTION OF GERMANY IN 1902.

We have now received the preliminary figures of the mineral and metal production of Germany in the year 1902. These figures are published in *Gluckauf*, in advance of the appearance of the complete official report.

The production of coal is reported, as below, in metric tons:

	1901.	1902.	Changes.
Coal	108,539,444	107,436,334	D. 1,103,110
Brown coal (lignite)	44,479,970	43,000,476	D. 1,479,494
Totals	153,019,414	150,436,810	D. 2,582,604

The decrease in coal was 1.0 per cent; in brown coal, 3.3 per cent. The total loss—1.7 per cent—in coal was not large. They were due chiefly to the conditions of the iron and other manufacturing enterprises, which were, last year, still suffering from the reaction following the rapid expansion of four or five years ago.

The production of ores and economically valuable minerals—other than coal—is reported as follows, in metric tons:

	1901.	1902.	Changes.
Asphalt	90,193	88,374	D. 1,819
Petroleum	44,095	49,725	I. 5,630
Rock-salt	985,050	1,010,412	I. 25,362
Kainit	1,498,569	1,322,633	D. 175,936
Other potash salts	2,036,325	1,962,384	D. 73,941
Iron ore	16,570,182	17,963,595	I. 1,393,413
Zinc ore	647,496	702,504	I. 55,008
Lead ore	153,341	167,855	I. 14,514
Copper ore	777,339	761,921	D. 15,418
Gold and silver ore	11,577	11,624	I. 47
Cobalt, nickel and bismuth ores	10,479	12,435	I. 1,956
Manganese ore	56,691	49,812	D. 6,879
Pyrites	157,433	165,225	I. 7,792

This table shows increases of importance in iron, lead and zinc ores, while there were decreases in copper ores and in the potash salts. Other changes were not of special importance. Of the copper ore over 90 per cent was mined in the Halle District—that is, at Mansfeld. Of the iron ore Elsass-Lothringen furnished more than half—8,793,496 tons; while 5,130,069 tons were from Luxemburg. The two districts named furnished 77.5 per cent of the

total. Of the zinc ore 81 per cent—568,715 tons—was from Silesia.

The production of the various salts—which are such an important item of German industry—at the works is shown below, in metric tons:

	1901.	1902.	Changes.
Common salt	578,751	572,846	D. 5,905
Potassium chloride	294,666	267,512	D. 27,154
Glauber salts	76,065	83,973	I. 7,908
Potassium sulphate	37,394	28,279	D. 9,115
Potassium-magnesium sulphate	15,612	18,147	I. 2.535
Magnesium sulphate	46,714	39,262	D. 7,452
Aluminum sulphate	46,807	47,905	I. 1,098

In these salts there were decreases in several cases, while the increases shown were comparatively light. The largest production of common salt last year was in the Clausthal District, 125,968 tons; the Halle District made 97,591 tons.

The total production of the various metallurgical works is given below; the statement includes all metals and other products, whether made from ores mined in Germany or from imported ores. The figures are in metric tons and kilograms:

	1901.	1902.	Changes.
Pig iron ....tons	7,880,087	8,529,900	I. 649,813
Spelter or zinc ....tons	166,283	174,927	I. 8,644
Lead, metallic ....tons	123,098	140,331	I. 17,233
Litharge ....tons	4,101	4,197	I. 96
Copper, ingot, etc....tons	31,317	30,591	D. 726
Black copper ....tons	365	434	I. 69
Silver ....kgs.	403,796	430,610	I. 26,814
Gold ....kgs.	2,755	2,664	D. 91
Nickel, bismuth and uranium ....tons	2,207	2,196	D. 11
Quicksilver ....kgs.	1,713	1,828	I. 115
Tin ....tons	1,451	1,986	I. 535
Antimony ....tons	2,526	3,542	I. 1,016
Arsenic products ....tons	2,549	2,827	I. 278
Sulphuric acid ....tons	835,000	894,499	I. 59,499
Concentrated ....tons	21.827	70,557	I. 48,730
Copper sulphate ....tons	5,192	4,997	D. 195

It will be seen that nearly all these products show increases, some of them large ones. The precious metals and antimony are produced chiefly from imported ores; tin and lead, though to a much smaller extent, are from imported ores.

In addition to the items given in the preceding tables, there were small outputs of graphite, kieserit, glauber-salts, boracite, tin ore, uranium ore, antimony ore, cinnabar, arsenical pyrites, natural alum, ocher and umber in the minerals; cadmium and sulphur in the metallurgical products. These are not reported separately, but a value of 500,000 marks ($119,000) is given for the total of these minor products.

QUEENSLAND MINERAL PRODUCTION.

We have received, through the courtesy of Mr. A. R. Macdonald, Under Secretary for Mines, advance figures of the mineral production of Queensland in 1902. The chief item is, of course, gold. The output in 1902 was 640,463 oz. fine gold, against 598,382 oz. in 1901; showing an increase of 42,081 oz., or 7 per cent, last year.

The total coal produced in 1902 was 501,531 tons, against 539,472 tons in 1901; showing a decrease of 37,941 tons, or 7.0 per cent.

The output of other metals and minerals reported is as follows:

	1901.	1902.	Changes.
Silver ....oz.	571,561	701,312	I. 129,752
Tin ....tons	1,661	2,085	I. 424
Lead ....tons	561	267	D. 294
Copper ....tons	3,061	3,784	I. 723
Iron ore ....tons	430	.....	D. 430
Tungsten ore ....tons	72	55	D. 17
Manganese ore ....tons	218	4,600	I. 4,382
Bismuth ore ....tons	20	1	D. 19
Bis. and molybdenite ....tons	26	41	I. 15
Lime, made ....tons	6,514	4,743	D. 1,771
Opals ....value	£7,400	£7,000	D. £400
Other gems ....value	6,000	5,000	D. 1,000

The total value of these minor products in 1902 was £417,675, against £382,933 in 1901; showing an increase of £34,742, or 9.1 per cent, last year.

BRITISH IRON ORE IMPORTS.—Imports of iron ore into Great Britain for the three months ending March 31 were 1,654,858 long tons. About four-fifths of this ore is from Spain.

BRITISH IRON AND STEEL EXPORTS.—Exports of iron and steel and manufactures thereof, from Great Britain for the three months ending March 31 are valued by the Board of Trade returns as below:

	1902.	1903	Changes.
Iron and steel ...	£6,084,749	£7,533,635	I. £1,448,886
Manufactures ...	4,258,581	4,718,615	I. 460,034
New ships	1,733,599	932,743	D. 800,856
Total	£12,076,929	£13,184,993	I. £1,108,064

The exports this year included 149,731 tons of pig iron to the United States, against 24,687 tons in the corresponding period in 1901; showing an increase of 125,044 tons.

LAKE SUPERIOR TRAFFIC.

We have heretofore given statements of the traffic through the Sault Ste. Marie Canals. The full report of the engineer in charge, for the season of 1902, gives some further figures, from which we take the following:

	1901.	1902.	Changes.
Total freight, tons	28,403,065	35,961,146	I. 7,558,081
Value of freight.	$289,906,865	$358,306,300	I. $68,399,435
Freight charges ..	$23,217,974	$26,566,189	I. $3,348,215
Av. movem't, miles	823.3	827.4	I. 4.1
Av. rate per ton, mile, cents	0.099	0.089	D. 0.010

The impressive points about these figures are the great amount of traffic and the extremely low average charge. The proportion of the values of mineral freight to the total was: Coal, 4.62 per cent; iron ore and iron, 26.75; copper, 6.40; total, 37.77 per cent.

ABSTRACTS OF OFFICIAL REPORTS.

Tharsis Copper and Sulphur Company, Spain.

The report of this company for the year 1902 shows net profits for the year amounting to £226,587; interest, £24,680; total, £251,267. General expenses were £43,182; amounts charged off for depreciation of property, £38,483; total, £81,665, leaving a balance of £169,602. To this is to be added £43,787 brought forward from previous year, making a total of £213,389.

From this surplus the directors recommend that £187,500 be appropriated to pay a dividend of 6s. per share—15 per cent—on the stock; the balance of £25,889 to be carried forward.

The production of the company's mines for the year was as follows, in long tons:

	1901.	1902.	Changes.
Mineral raised	400,162	342,692	D. 57,470
Pyrites shipped	371,412	382,053	I. 10,641
Copper precipitate shipped	6,133	5,869	D. 264
Fine copper produced	7,427	6,708	D. 719

The report says: "At the general meeting last April, it was stated that unless there was an abundant rainfall during 1902, the production of copper would probably be from 1,200 to 1,400 tons less than for 1901. Fortunately, there was a plenteous supply of water during the whole year, and the quantity of copper turned out was 6,708 tons, against 7,427 tons for 1901, showing a falling off of only 719 tons. The production was entirely from the mines in Spain, no shipments having been made from the recently acquired mine in Norway. A considerable amount of development work was done at this mine during 1902, with rather disappointing results. A large quantity of ore has been opened up, but of a much lower grade in copper than was anticipated, judging by the results obtained from the investigation works carried out before the purchase was effected. The purchase price was a small one, and it is hoped that payable ore may be met with in sufficient quantity to make good the amount expended. More than that can hardly be expected, and the venture has been a disappointing one. The search for new mines has been prosecuted with gerat energy in various parts of the world, but out of the very large number of properties examined, not one has been considered suitable for the company's requirements. The search after a good property is, however, being actively continued, and will, it is hoped, be ultimately successful. Meanwhile, the investigations which have been constantly carried on at the Calanas Mine in Spain have given gratifying results, and large bodies of ore have been. opened up, which, although of low grade in copper, will, it is expected, allow of operations being profitably carried on for many years to come."

Mountain Copper Company, California.

The report of this company covers the calendar year 1902. It is the first report made by the company since its reorganization a little over a year ago. Under this the capital stock was reduced to £250,000 in ordinary shares and £1,000,000 in 6 per cent debenture stock was issued to be retired gradually from the proceedings of the mine workings. The profit and loss account, as stated in sterling from the London office, shows that the profit on sales of copper was £117,846. Rentals and miscellaneous profits amounted to £8,462, making a total of £124,308. The expenses for new work at the mine and for the London office were £14,304, leaving a balance of £110,004. The balance accruing from the assets of the old company after paying expenditures of transfers and liquidation amounted to £335, making a total credit of £110,039. The debenture interest was £60,000, leaving a balance of £50,339. A portion of this will be credited to the purchase price of the old company's property in respect of the proportion of profit made up to the date of the incorporation of the present company, and the remainder will be carried forward. A part of the debenture stock will be paid later in the year.

The directors' report says that the property and assets of the old company were duly transferred to the reorganized company as of date January 1, 1902. The operations during the year show that 139,903 tons of ore were extracted from the mines. The quantity smelted at the Keswick works was 149,878 tons of ore, the product being 7,854 tons of copper in converter bars. This shows an average yield of 5.23 per cent of copper. The converter bars from Keswick are sent to New Jersey to be refined. The total refined copper reported from the refining works during the year was 8,739 tons. The sales of copper for delivery during the year 7,822 tons. The fall in the price of copper just before the beginning of the year decreased the profits of the company considerably.

Mine operations were impeded, and the output reduced by the breaking out of fire in some of the workings. The fire was kept under control, however, and a sufficient water supply having been obtained at the mines, it is now believed that the fire is completely extinguished.

The output of ore from the mine and the production from the smelters were also restricted by a strike of the workmen which took place in the autumn, stopping all operations. Work was restricted until February of the current year, and then only on a small scale, but labor is now gradually coming back to the mine and works.

Calumet & Arizona Mining Company.

This company is opening up a copper property in the Bisbee District in Arizona. Its report covers a period of 10 months, from March 1 to December 31, 1902. The financial statement shows that cash on hand March 1 was $208,489; borrowed on notes, $350,000; interest, $277; total, $558,766. Payments were: Remittances to mine, $547,880; office expenses, $3,256; total, $551,136, leaving a balance on hand of $7,630.

During the year the hoisting equipment, ore-bins and tramway at the mine were completed. The main shaft was sunk 70 ft., to a total depth of 1,190 ft. Other work included 722 ft. raises and winzes, 3,595 ft. drifts and cross-cuts. These have largely increased the reserves of ore in sight. There was taken out in exploration 10,509 tons; from stopes, 11,876 tons; a total of 22,385 tons of ore. The actual payments at mine were: Mine and surface expenses, $177,756; smelter, $48,538; office and other expenses, $15,280; construction at mine, $88,315; construction at smelter, $221,210; total, $551,099.

The president's report says: "We have changed the fiscal year to correspond with the calendar year. The report therefore is for ten months.

"Our furnace was blown in November 15, 1902. Our product from November 15 to December 31 was 2,066,647 lb. The product for December was 800 tons copper, 99 per cent fine. On account of the

small number of tons of ore smelted for each ton of bullion produced, the gold and silver value in the bullion is comparatively low, averaging $8 per ton for December, but values of the precious metals have been increasing and the average values for February is close to $12 per ton of bullion.

"Our copper shipments are by rail to Galveston and by boat from Galveston. The copper is being treated electrolytically at the works of the Nichols Chemical Company, of New York. It is fully three months after the date of shipment from Douglas before the copper is ready for delivery by the electrolytic works. We expect when the second furnace is in commission to produce 50 tons refined copper daily, barring accidents. A third furnace will be added the coming year, as a reserve. The number of men in the employ of the company for December was 321; of this number 166 were employed at the mine and 155 at the smelter. Our ore is transported from Bisbee to Douglas under contract with the El Paso & Southwestern Railroad Company. We have contracted with Phelps, Dodge & Co. to act as our agents in selling copper, for the year 1903.

"We have entered into a contract with the Copper Queen Consolidated Mining Company regarding side lines to our properties whereby each agrees to accept vertical lines in all cases as boundaries.

"Contracts have been made with physicians at Bisbee and Douglas to care for our men.

"Our smelter buildings at Douglas were completed, and the furnace and converter in operation in less than one year. We consider this a remarkable record, as also the December product from one 250-ton furnace so soon after blowing in. We give credit for these records to I. L. Merrill, superintendent, and D. E. Heller, superintendent of smelters.

"Expenditures on machinery and equipment at mine and smelter were $346,192. The value of supplies on hand, copper on hand, and cash was $307,834, while the entire liabilities exceed that amount by $102,018 only.

"The property has been placed on a good paying basis, the mine developed to furnish ore for a period of at least six years ahead, and construction expense at present workings, at both mine and smelter plants, well along towards completion. The earnings from operations will be large each month, and all liabilities will be paid in the near future. The developments at the mine warrant the belief that we have a most valuable property."

Old Dominion Copper Mining and Smelting Company, Arizona.

The report of this company covers the year 1902. It is the first report of the new management, which succeeded the old Bigelow board last year; and contains, besides the usual statements, special reports on the mine and its equipment.

The report shows that during the year 68,840 tons of ore were mined and smelted. The product was 7,705,327 lb. pig copper (95.95 per cent) and 850,078 lb. matte (70.52 per cent); the total being equal to 7,992,550 lb. fine copper. The average yield in fine copper was 116.1 lb. per ton, or 5.8 per cent. The costs per ton of ore mined were $5.70; per ton smelted, $4.27. The earnings and expenses, with the averages per pound of fine copper are shown below:

	Total.	Per lb. copper.
Sales of product	$883,378	11.05
Mining	$392,507	4.91
Smelting	293,670	3.68
Handling, selling and general expense.	130,559	1.63
Total working expenses	$816,736	10.22
Construction	47,175	0.59
Total expenses	$863,911	10.81
Net profit	$19,467	0.24

To the net profit above is to be added surplus of assets brought forward from 1901, amounting to $337,207; value of ores on dump, flue dust, etc., $100,000; making a total balance of $456,674 forward to current year.

Development work done during the year reached a total of 5,035 ft.; in addition to this, 589 ft. of diamond drilling were done. The smelter was in operation 316 days during the year. The loss of time—49 days—was due chiefly to delays by the railroads in delivering fuel. Two Sterling boilers of 200 h.p. each were added to the equipment; also a No. 3 Henry S. Mould briquetting press.

The directors' report says: "The equipment, purchased to a large extent during the preceding three years, was of poor quality. The air compressor, for instance, was defective, and expensive in operation, and of the three furnaces only one could be run at a time, on account of lack of power. Two new boilers, each with a capacity of 200 h.p., have already been installed, also a briquetting plant to work up the flue dust. The sinking of a new shaft has been begun, and preparations are being made to undertake other improvements.

"On April 2, 1902, the company had a floating indebtedness of $359,178, on which it was paying interest at the rate of 5 per cent per annum. On December 31, 1902, this indebtedness had, through sales of copper on hand, and such profit as had been made from operating the mine since April 2, 1902, been reduced to $48,811. This amount has since been paid from the sales of copper on hand and money is now accumulating to be applied to the payment of improvements contemplated.

"The matte on the dump is being rapidly shipped in view of the advanced price of copper, and it is believed that the amount available from the sale of the copper in the matte, flue dust, Continental ores and sulphide ores on hand at the mine, together with the profits from operation during the year 1903 (if the copper market remains favorable), will be sufficient to cover the entire cost of the extensive improvements undertaken, so that the company need not be burdened either by a floating indebtedness or bond issue, or the issue of additional stock. The expense of the improvements commenced, sinking a new shaft, and the construction of a new smelter and concentrating mill is estimated at from $300,000 to $400,000. . . .

"During the latter part of the year we have been experimenting with matte smelting, and also treating a lower grade of ore to obtain data for the new plant, which accounts for the lower average grade of the ore in copper—5.80 per cent in 1902, against 6.23 in 1901. By the present method the loss in slag is about 2 per cent, whereas under the new method the loss should be less than 0.5 per cent. . . .

"The reduction in cost of copper is due in part to lessened development work on account of the various shut-downs and to the reduction of the selling commission made through the change, April 17, 1902, of our selling agents from the United Metals Selling Company to the American Metal Company, but mainly to the reduction of freights, which commenced October 17, 1902. The aggregate freight rates for the year ending December 31, 1901 (counting both incoming and outgoing freight) on each pound of copper produced, was 3½c. Under contracts recently made with the railroad companies covering a period of two years, reduction of rates have been secured. Material reductions have also been obtained on freight rates for coal and other supplies. The saving to the company from all these reductions on the basis of its production during 1901 would be fully $150,000 a year, or about 1½c. per pond in the cost of copper. In view of the contemplated extensions of other railroad systems to Globe, it is believed that even more favorable rates can be secured when the present contract expires.

"The directors are confirmed in the belief, already expressed in the report of July 21, 1902, that the cost of production of fine copper laid down in New York and sold as pig copper, will be still further reduced to about 8c., when the improvements in the plant now in process and under contemplation shall have been completed."

The report adds that suits have been begun against Mr. A. S. Bigelow and the Estate of Leonard Lewisohn to secure settlements on points in controversy, including profits on stock issues.

BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail prices. These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

Records of the Geological Survey of Victoria, Volume I, Part 1. Prof. J. W. Gregory, Director of Survey. Pages, 92, with maps and illustrations.

Elektro-Metallurgie des Nickels. By Dr. W. Borchers. Halle-a-S., Germany; Wilhelm Knapp. Pages, 36; illustrated. Price (in New York), 50 cents.

Thirty-third Annual Report of the Board of Directors of City Trusts of the City of Philadelphia. 1902. Philadelphia; published by the City. Pages, 250; illustrated.

Annual Report of the City Engineer of the City of Providence. Otis F. Clapp, City Engineer of Providence, R. I.; published by the City. Pages, 148; illustrated.

The British South Africa Company. Reports on the Administration of Rhodesia, 1901-1902. London, England; published by the Company. Pages, 474; with maps.

History of the Coolgardie Water Scheme, Western Australia. By Hon. C. H. Rason, Minister of Mines. Perth, W. A.; Government Printer. Pages, 20; illustrated.

Tasmania. Report of the Secretary for Mines. 1901-1902. Hon. W. H. Wallace, Secretary. Hobart, Tasmania; Government Printer. Pages, 304; with maps and illustrations.

Great Britain. General Report on Mines and Quarries. Part IV. Foreign and Colonial Statistics. 1901. Edited for the Home Office by Dr. C. Le Neve Foster. London; H. M. Stationery Office. Pages, 480.

Mining Bureau, Philippine Islands. Bulletin No. 2. Complete List of Spanish Mining Claims Recorded in the Bureau. Compiled by Charles H. Burritt, Chief of Bureau. Manila, P. I.; Bureau of Public Printing. Pages, 28.

BOOKS REVIEWED.

Journal of the Mining Society of Nova Scotia. Volume VI. Edited by H. Tiers. Halifax, N. S.; Published by the Society. Pages, 108.

This volume gives the proceedings of the Mining Society of Nova Scotia for two years. The papers are largely of local interest and contain much that is of value. Among them are notes on Non-Caking Nova Scotia Coals, by H. F. Mason; A Combined Exhaust and Blast Fan in Colliery Ventilation, by F. T. Peacock; Technical Education, by Alexander McNeil; the West Gore Antimony Deposits by W. R. Asquith; and the Potter's Clay Deposits at Middle Musquodoboit, by H. F. Mason. Mr. George W. Stewart presents a plea for a government assay office and Mr. Harry Piers describes the Provincial Museum and science library, pleading for their enlargement and the extension of their objects. The proceedings included discussions on the Mining Departments and its conduct, on the value of topographical and geological maps, and the provincial encouragement of mining enterprises.

The Thermodynamics of Heat Engines. By Prof. Sidney A. Reeve. New York; the Macmillan Company. London; Macmillan & Co., Limited. Pages, 372; with diagrams and tables. Price, $2.60.

Prof. Reeve, who has done much creditable work, has prepared in this volume a general summary of investigations made up to date on the principles of thermodynamics and their application. The first and larger portion of the book is devoted to theory, treating in successive chapters of general principles, the thermal properties of matter, the laws of gases, the steam engine cycle, the gas engine cycle, hot air and refrigerating. The second part—the application to practice—includes chapters on the simple steam engine, the compound steam engine and the gas engine.

An appendix gives a number of tables showing heat energy, specific and latent heats, melting heats, etc. The steam tables have been compiled from various sources by Prof. Reeve, and are original with this book. It appears to be an excellent summary of the present condition of our knowledge of thermodynamics.

State Geological Survey of North Dakota. Second Biennial Report, 1901-1902. Dr. Frank A. Wilder, State Geologist. Bismarck, N. Dak.; published for the Survey. Pages, 262; with maps and illustrations.

This report, the second one issued by the Geological Survey of North Dakota, under charge of Dr. Frank A. Wilder, shows some creditable work. The first part of the volume is given up to administrative reports and to statistics of mineral production. By far the more important portion of this output is in the lignites of the state which are now being mined in many localities. These have been described in the articles by Dr. Wilder, published in the Engineering and Mining Journal of February 7 and February 28. The other production of the State so far is limited to cement, building stone and the clay products. In view of this, the larger part of the report is naturally devoted to the lignites. Articles are given in the report on the general geology of the lignite area, on the lignites by counties, on the mining methods, on the fuel values, and on the importance to the State. Other monographs in the report are on irrigation in North Dakota, which is a subject of much importance, especially in the western part of the State, and on the water resources of the Devil's Lake Region. A brief summary of the laws governing coal land entries is added as an appendix.

Bulletin of the New York State Museum, No. 44, *Vol.* 8, *November,* 1901. *Lime and Cement Industries of New York.* By Dr. Heinrich Ries. Chapters on the *Cement Industry in New York.* By Edwin E. Eckel. Albany; University of the State of New York. Pages 328, with maps and illustrations.

The purposes of the book as stated by Dr. Ries is "to give information to quarry owners concerning the uses of limestone and the characters which the stone should possess to make it of value for use in various industries, and to supply limestone consumers with information regarding the extent and character of the limestone formations of New York."

Dr. Ries first carefully discusses the origin, chemical and mineralogical composition, geologic occurrence, color and uses of limestone. The manufacture of lime from limestone is then described, which includes a description of the different kinds of cement, analyses of standard American and European brands, methods for manufacturing and testing them, and specifications for Portland cement in America, Germany and France; this section concludes with a bibliography of works on cement manufacture. A geologic description with chemical analyses of the limestone occurring in 41 counties then follows, together with photographs of different quarries and a list of the cement producers throughout the State.

Mr. E. C. Eckel, appends special information concerning the history of the portland cement industry in New York; the manufacture of cement; the specifications for and tests made by the State engineers from 1897 to 1900 on cement intended for use in canal improvements, including diagrams of the yearly result of these tests for tensile strength, time of setting and fineness of the different brands of cement. This section of the work ends with a table of about a thousand analyses of limestones occurring throughout the United States.

The book is carefully printed, well illustrated and completely indexed, the maps showing the distribution of limestones and location of limestone quarries, marl deposits and cement manufactories are large and clear. In all cases, reference is made to the sources from which the information was obtained. It shows throughout the care that has been taken in its compilation.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

Specially Reported.

Meaning of the Word "Surface" in Conveyances of Mineral Land.—The word "surface," when specifically used as a subject of conveyance, has a definite and certain meaning, and means that portion of the land which is or may be used for agricultural purposes. And where W. conveyed to M. all the surface of 160 acres, retaining the right to make and maintain on said tract of land such openings as might be necessary for ventilation, for drainage and for the taking out of all the coal without any liability for injury to the surface of the land, or anything thereon by reason of the mining of said coal and the right to remove the same, and the rights to the ore, etc., it was held that this conveyance was an express grant of the surface only, and severed it from the underlying strata.—Williams v. South Penn Oil Company (43 *Southeastern Reporter,* 214); Supreme Court of West Virginia.

Limitation on Right to Inspect Books in Contest on Mining Sale.—A party claimed that another had, by fraud and collusion, induced him to sell for a small consideration his interest in an option to buy a mining claim, and had subsequently purchased the claim; therefore, he sued to recover an interest in same. It was held that a provision in an order authorizing an inspection of all books and records of the company which had owned the claim before such sale was erroneous, as the inspection should have been limited to an examination of only those portions of the books which related to the option to buy or sell the claim. A provision in such order permitting an inspection of the stope sheets and stope books showing the ore extracted from the claims was erroneous, such party being entitled to an inspection only of such books to the extent that they showed ore extracted through the workings of such claims from the claim in controversy.—State ex rel. Boston & Montana Consolidated Copper & Silver Mining Company v. District Court, etc. (71 *Pacific Reporter,* 602); Supreme Court of Montana.

Party Not Entitled to an Interest Unless He Induces Investment.—A party declined T.'s proposition to buy an interest in his mining claim, but intimated that he could place it "before capital," and T. replied if you will place it before capital I will give you a third interest therein, to which the other replied, "that's all right; I will do the best I can to place this before capital." The latter also agreed to make a small advancement towards development, that a better showing might be made, so as to induce capital to take hold of it. Afterwards, for the purpose of getting the agreement in writing, he sent to T., and T. signed a paper reciting that T. thereby gave a third interest in the claim. Later he went on the claim with T., and did two or three hours' work of development and getting samples. It was held that the paper vested no legal estate in plaintiff; the agreement being condition and the consideration being that plaintiff should not merely call the attention of capital to the claim, but induce its investment in same.—Baum v. Rainbow Mining, Milling and Smelting Company (71 *Pacific Reporter,* 538); Supreme Court of Oregon.

Employer Liable When Negligence of Fellow Servant Renders Place Unsafe.—Where one employed in a coal mine to remove the dirt while other workmen bore under the vein of coal in order that it may be broken by blasting from above, and the person employed to do the blasting, drills holes into the vein further than it had been undermined, so that when the blast was exploded it left some clay partially detached from the vein, and with knowledge of this condition a companion (an inexperienced employee) proceeds to undermine the vein as usual until the loose clay gave way, injuring the first party, it was held that this showed negligence on the part of the employer as a matter of law, in not providing a safe place in which to work, and hence the negligence of other workmen, even if they were fellow servants of the one injured, was imputable to the employer; and where an injury is the result of negligence of the employer to provide a safe place it is not necessary to show gross negligence in order to recover.—Tradewater Coal Company v. Johnson (75 *Southwestern Reporter,* 274); Court of Appeals of Kentucky.

Deposit of Rental According to Agreement the Same as Payment of Same.—Where an oil and gas lease provided that unless a well shall be completed within three months, or unless lessee shall pay at the rate of $22.25 quarterly in advance for each additional three months such completion is delayed, and it is agreed that the completion of such well shall be and operate as full liquidation of all rental under this provision during the remainder of the term, and that such payments may be made direct to the lessor or deposited to his credit in a certain bank. It was held that the deposit of a payment in such bank to the credit of the lessor on or before the day on which such payment fell due was a full payment to the lessor, and it was immaterial whether it was paid in lawful money or by check or draft, or otherwise, and that the lessor could not avoid such lease or declare a forfeiture of same within the time for which he has so received the stipulated rental, and a lease executed by him to a third party within such time intended as an act of forfeiture was void.—Friend v. Mallory (43 *Southeastern Reporter,* 114); Supreme Court of Appeals of West Virginia.

Rights of Locators in Texas Against Purchasers of Lands from the State.—The law of Texas (1883, Chapter 88, Section 14) provides that minerals of all lands sold under the act are reserved by the State for the use of the fund to which the lands belong. The mining act of March 29, 1889, authorizes the sale of the mineral-bearing public lands, including school, university and asylum lands; but the sale of the minerals separately from the lands is not provided for, except in special instances mentioned in section 12, which provides that when a mineral location has been made on land disposed of by the State since the passage of the act of 1883 and the location has been abandoned, the locator's rights shall be preserved as against the purchaser from the State. It was held, that where land had been sold by the State prior to the enactment of the act of 1889 and the mineral location thereon was not made until 1900, the locator acquired no title to his location against the purchaser from the State.—Heil v. Martin (71 *Southwestern Reporter,* 814); Supreme Court of Texas.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
Letters should be addressed to the Managing Editor.
We do not hold ourselves responsible for the opinions expressed by correspondents.

The Robinson-Greenawaldt Process.

Sir.—In your issue of April 11 I notice a letter signed "L. G. W.," dated April 1, asking for information relative to the Robinson and Greenawaldt chemical process for gold extraction, and thinking I may be able to put him in the way of ascertaining what he desires, write to say that in the summer of 1898 I inspected a plant erected at Denver for the commercial demonstration of this process. It was then in operation and apparently doing successful work.

W. D. Johnson.

New York, April 15, 1903.

Sir.—In your issue of April 11 information was asked for regarding the Robinson-Greenawaldt pro-

cess. The enclosed clipping, together with cut of mill during construction, may answer your purpose. The mill is now completed and in daily operation, treating the refractory ores of Boulder County, Colorado. As the system is something of a radical departure from the ordinary barrel chlorination process, no doubt many of your readers would be interested in a full description of both mill and process. I understand something similar is being adopted by some of the mills at Colorado City. The inventor and patentee, is John A. Greenawaldt, of Wall Street, Boulder County, Colo.

F. W. AINSWORTH.

Boston, April 15, 1903.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Tin Dross or Residues.—Where can we obtain information relating to the smelting or reduction of tin dross or residues.—M. H.

Answer.—In further reply to this question, an answer to which was given in our issue of March 28 last, Messrs. Robertson & Bense—whose address is Stadthausbrucke, 131, Hamburg, Germany—inform us that they are purchasers of such material, and treat it on a large scale. They are prepared to receive consignments.

Electrically Driven Blowing Engines.—Do you know of any case where the blast is furnished for copper or lead blast-furnaces by electric power?—S. C. C.

Answer.—At the Germania Smelter at Salt Lake, Utah, blast is furnished by rotary blowers, each run by two motors. At the East Helena Smelter in Montana an Allis piston blower is operated electrically, an induction motor being used. The large copper furnaces of the Granby Company at Grand Forks, B. C., received blast from electrically driven blowing engines; the electricity is generated by water power.

Cobalt Ores.—Where are the foreign works for the reduction of cobalt ores located, and what are their names?—C. B. N.

Answer.—With regard to this question an answer to which was given in our issue of March 28 last, we are informed that the Royal Saxon Blaufarbenwerke, at Oberschlema, Saxony, Germany, buy large quantities of cobalt ores. A communication to these works should state the condition of the mine as to development, etc., and the quantity of ore which can probably be supplied. It may be stated, however, that these works will not buy on local assays. Payment for ores is made only on assays and weights found at Oberschlema.

We are also informed that Messrs. Robertson & Bense, of Hamburg, Germany, buy cobalt ores, and are ready to give information to parties having such ores for sale.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending April 14, 1903.

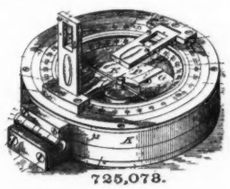
725,025. BRICK-MAKING MACHINE.—Ralph C. Bishop, St. Joseph, Mich. A brick-machine comprising an upper jaw and an eccentric shaft, links connecting said jaw with said shaft, a hand-lever and gearing for manually rotating said shaft, and adapted for independently adjusting said upper jaw, a lower jaw, power-transmitting connections for operating said lower jaw, and a hand-lever adapted and arranged for lifting said lower jaw for the purpose of ejecting the brick.

725,047. VALVE-GEAR FOR PUMPS OR THE LIKE.—Edward Crowe, Sheffield, England. In a pump, fluid compressor, or blowing engine the combination with valves of the Corliss or other type, of springs or weights so applied as to cause the valves to open when the fluid pressure on the back of the valve ceases or is counterbalanced, positively acting valve gear operating to close the valves at the proper moments and to keep them closed until they are so retained by the fluid pressure, and trip gear engaging the valves so as to lock them in the closed position, said trip gear being adapted to be operated by a spring which is permitted to act by the equalization of the pressure on the two sides of a piston in communication respectively with the main cylinder and with the passages controlled by the distributing valves.

725,056. FURNACE FOR ROASTING ORES.—Thomas Edwards, Ballarat, Victoria, Australia. A reverberatory furnace comprising an elongated hearth, and openings disposed at different points lengthwise of said hearth and extending up through the same to feed air to the furnace.

725,060. RETORT.—Frank B. Felt and Charles E. Felt, Chicago, Ill., assignors, by direct and mesne assignments, to the Oxygen Light and Fuel Company. The combination with a retort having a body portion to contain a liquid mass to be treated and an upper portion or expansion space of much greater diameter, said upper portion being provided with a discharge passage above, of a series of nipples arranged in the retort to discharge upwardly near the bottom of said body and means for supplying a fluid reagent to discharge through said nipples; whereby said reagent introduced in the lower part of the mass to be treated rises through the same and collects as a foamy mass in the greatly enlarged upper portion.

725,073. SURVEYING INSTRUMENT.—Gustave M. Gouyard, Denver, Colo. A survey instrument consisting of a body portion having a needle chamber, a magnetic needle poised in said chamber, and means for raising the same vertically and clamping it in a fixed position; a degree



725,078.

circle located in the top of said chamber above the said needle and bubble tubes located in the bottom thereof; a ring which normally rests upon the said body portion and is hinged thereto so as to be capable of a vertical, as well as a horizontal position, the said ring carrying a degree circle, and a revoluble ring having sights secured thereto; and means for limiting the ring, when raised to a true vertical position.

725,157. ADJUSTABLE BENCH FOR ROLLS.—Harry E. Sheldon, Aspinwall, Pa. A set of rolls, a pivoted bench for supporting a pile of sheets, mechanism for swinging said bench on its pivot so as to bring the top of each sheet into such a position relative to the pass between the rolls that the sheets may be serially fed from the pile on the bench into the pass, or from the pass to form a pile on the bench.

725,161. PROCESS OF EXTRACTING BROMINE.—Albert W. Smith, Cleveland, Ohio.—The steps in the process of extracting bromine, which consists in treating a bromine laden gas to the action of an alkaline carbonate and then subject the resultant gases to the action of an absorbent for carbon dioxide.

725,173. FURNACE FOR HEATING OR MELTING MATERIALS.—William P. Thompson, Liverpool, England. In a furnace, the combination of a heating chamber, a series of nozzles pointing downward directly onto the material to be heated in said heating chamber; means, such as pipes, for supplying air and gas in proportion substantially as described and under such high pressure that the effluent mixture hereafter mentioned shall be ejected against the material to be heated at a velocity greater than the speed of flame in such mixture, one set of pipes supplying air, and the other set of pipes supplying gas to each nozzle; and means for thoroughly mixing these gases in the nozzles.

725,208. ELECTROLYTIC COATING APPARATUS.—Heinrich W. Botz, Ludwigshafen-on-the-Rhine, Germany, assignor to Columbus Electrizitats-Gesellschaft mit Beschrankter Haftung, Ludwigshafen-on-the-Rhine, Bavaria, Germany. In an electrolytical apparatus for coating sheet metal, a frame adapted to be moved in vertical position and provided with distance pieces.

725,227. ROCK DRILL.—Lucious E. Decker, Chattanooga, Tenn., assignor of three-fourths to P. B. Griffin and C. V. Hoover, Chattanooga, Tenn., and C. B. Rogers, Bessemer, Ala. In a drill the combination of a suitable support, a reciprocating plunger provided with rack teeth, and a spring adapted when compressed to project the plunger, a gear element engaging the rack teeth on the plunger, a drive shaft on which the gear element is loosely mounted, a clutch operating at predetermined intervals for rigidly connecting the gear wheel to the shaft to operate said gear-wheel to retract the plunger, and means for throwing the said clutch mechanism out of operation.

725,257. GOLD EXTRACTION PROCESS.—Thomas B. Joseph, Mercur, Utah. The process of extracting gold and silver from ore containing the same, when in a suitable condition, which consists in subjecting the said ore to a leaching action of a solution of water, cyanide of potassium, bromine, hydrate of calcium, and carbon dioxide, intimately mixed together, and simultaneously agitating the ore by compressed air being forced upward through the same.

725,297. TREATMENT OF MATTES AND RAW METALS.—Hermann G. C. Thofehrn, Paris, France. An improved treatment of mattes and raw metals such as copper mattes, raw copper, nickel mattes, tin or lead mattes, cast iron, with the view of obtaining metallic copper, nickel, tin, lead, steel or puddling iron, consisting in blowing in a hearth-furnace onto the surface of a metalic bath formed of mattes or raw metals and by means of blast pipes distributed around the furnace, a mixture composed of a fluid oxidizing agent formed of steam and air, a solid oxidizing agent formed by oxides of the metals to be treated previously brought to a state of grains, a metallurgic flux previously reduced into grains, and hydrocarbons.

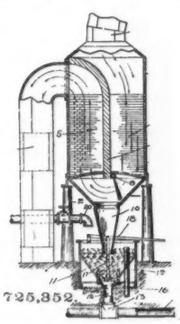
725,301. STONE, GRANITE OR MARBLE CUTTING MACHINERY.—Samuel W. Vint, Bradford, England. In stone, granite and marble cutting machinery, a vertical support or shaft, vessel, pipes, wheel rim, divided into hoppers, flexible tubes, laths, with means for holding the tubes in position.

725,309. AMALGAMATING MACHINE.—Amos H. Woodruff, Chicago, Ill. The combination with an amalgamating cylinder, of foraminated, superimposed cylinders, on said amalgamating cylinder, longitudinally separable into halves.

725,321. APPARATUS FOR TREATING ORES.—Stanley C. C. Currie, New York, N. Y., assignor of one-half to Wm. Courtnay, New York, N. Y. In an apparatus for the treatment of ores, an ore-hopper and conveyor leading therefrom, a substantially closed chamber to which said ore is conveyed, an incline in said chamber, and a heating drum leading from the foot of the incline through a furnace, and means for forcing the heated gases from the drum into the closed chamber, all combined.

725,324. METHOD OF TREATING METAL PLATES OR SHEETS.—Alfred J. Diescher, Pittsburg, Pa., assignor of one-half to Samuel E. Diescher, Pittsburg, Pa. The method which consists in suitably heating a blank, roughing the same down to a plate or sheet, folding said plate or sheet in a plaited form, reheating the folded plate or sheet, sending the folded pack through a finishing train and shearing the folded edges.

725,352. APPARATUS FOR SEPARATING AND COLLECTING IMPURITIES FROM METALLURGICAL FURNACE GASES.—Edward J. McAleer, Sharpsville, Pa. An apparatus for removing impurities from blast-furnace gases and collecting the impurities, comprising, in combination with a separating chamber having inlet and outlet



725,352.

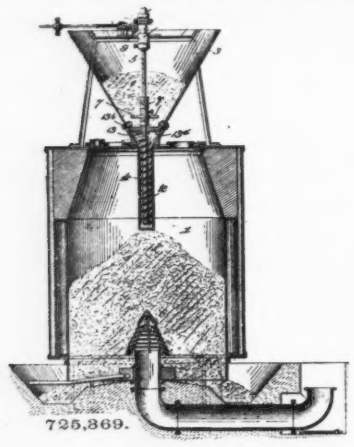
openings, an open passage for the blast furnace gases through the chamber formed by the walls of the separating chamber and a centrally disposed dividing wall, a fluid supply located in the separating chamber through which the gases pass, a tank below the separating chamber into which the fluid and impurities from the gases fall, and a valve for controlling the discharge from said tank.

725,361. METHOD OF MAKING NITROGEN COMPOUNDS.—Ferdinand E. Polzeniusz, Frankfort-on-the-Main, Germany. Method of manufacturing nitrogen compounds by preparing a mixture of carbides of alkaline earths with chlorides of metals and by heating said mixture in an atmosphere of nitrogen.

725,363. PROCESS OF TREATING OIL-BEARING MATERIALS.—Nathaniel B. Powter, Brooklyn, N. Y., assignor to the Powter Company, New York, N. Y. A herein-described process of treating oil-bearing substances which consists in first heating a mass of the material to be treated while under a pressure less than that of atmospheric pressure, and second in heating the mass to a higher temperature while subjected to pressure by a dry compressed gas.

725,369. AUTOMATIC FUEL-FEEDING DEVICE FOR GAS PRODUCERS.—James G. Sanderson, Scranton, Pa. In a gas-tight feeding device, the combination with a com-

bustion chamber, a fuel feeding hopper, and a chute depending from the hopper into the said chamber to the fuel-


725,369.

line, of conveying means movable within said chute, so as to be supported by the fuel in the furnace when inoperative, and to drop by its own weight to throw it into operative connection with a suitable source of power.

725,406. UNLOADING APPARATUS.—Charles Campbell, Grant Park, Ill. In an unloading apparatus, the combination with the supporting frame having upward projections at its ends, with a series of boxes resting on said frame, the end boxes resting against the inner surface of said projections to prevent their longitudinal movement thereon, each of said boxes having its lower side edges recessed, and provided with means to engage a hoisting device, a counterweighted door pivotally secured between the sides of each of the boxes at their lower portions, said door having a reduced portion to extend between the box sides, and a widened portion to rest in the said recesses of the sides, and to project beyond the same, and means to automatically fasten each of the doors, when closed.

725,420. MINER'S TOOL.—Alfred V. Des Moineaux, Silver Plume, Colo., assignor of three-fourths to Helen Des Moineaux, Silver Plume, Colo. A miner's tool, comprising privoted members, one of which is provided with an open-

725,420.

ing or space and the other one is formed with spaced notches, and a lance having a slotted shank slidably confined in the space of one member and provided with a locking projection arranged to fit into either of the notches of the other member.

725,427. APPARATUS FOR THE MANUFACTURE OF SULPHURIC ACID.—Oscar H. Eliel, Lasalle, Ill. A denitrating and concentrating tower comprising a plurality of independent filled sections, in combination with the sulphur burner and acid chamber, valved flues severally connecting the top of the tower with the suphur burner, and valved flues severally connecting the bottom of the tower with the acid chamber.

725,450. AIR COMPRESSOR AND HEATER.—Charles R. Keller, Dayton, Ohio.—The combination in an electrical heating apparatus for heating air under compression, for motive power, a cylinder, two perforated disks arranged on the interior of said cylinder adjacent to the ends thereof, caps inclosing the ends of said cylinder and providing chambers between the perforated disks and said caps, a series of solid electrical conductors arranged between said disks and serving to heat air introduced to the chamber between said disks, an air inlet pipe through which air is inducted under compression at one end of the cylinder, and an air outlet pipe at the opposite end of the cylinder through which heated air is discharged for the purposes specified, the inlet and outlet pipes communicating with the chambers in the ends of the cylinder.

725,471. MEANS FOR REMOVING COKE-OVEN DOORS.—Edwin A. Moore, Philadelphia, Pa. A series of coke-ovens arranged side by side, doors for said ovens, and a track on top of the structure; in combination with a car mounted on said track, a trolley frame on the car, a trolley supported on said frame, means on the car for propelling the car, a connection between the trolley and an oven door, and means for moving the trolley and raising the door synchronously.

725,490. FURNACE.—Edward H. Schwartz, Chicago, Ill., assignor to the Hawley Down Draft Furnace Company, Chicago, Ill. In a furnace the combination of a casing, a pair of independently removable burners secured to the casing and to each other to form a continuous air passage and a gas or oil injector for each tuyere.

725,501. METHOD OF MAKING SODIUM BICHROMATE.—Francis M. Spence, David D. Spence and Thomas J. I. Craig, Manchester, and John J. Hood, London, England, assignors to Peter Spence & Sons, Limited, Manchester, England. A process for the production of sodium bichromate which consists in passing carbon dioxide into a solution containing both sodium monochromate and ammonia until about one-half of the sodium has precipitated as sodium bicarbonate and concurrently about one-half of the chromic acid has combined with ammonia as ammonium monochromate, separating the precipitated sodium bicarbonate, boiling the solution of sodium monochromate and ammonium monochromate to drive off the ammonia, and further concentrating the thus formed sodium bichromate solution.

725,519. KILN.—Charles E. Watts, Brazil, Ind. The combination with a kiln having a main flue and a damper arranged therein, a flue surrounding the said kiln, a plurality of fire-boxes, a series of ducts or passages connecting the fire-boxes of the kiln with the flue surrounding the said kiln, plates for closing the front sides of the fire-boxes, a duct connecting the two flues, a damper arranged therein, a manhole leading to the main flue, and a cap adapted to close the manhole.

725,520. METHOD OF REDUCING METALLIC OXIDES WITH METALLIC ALUMINUM.—Frederick C. Weber, Chicago, Ill. A method of treating metallic oxides with aluminum in the production of metals and metalloids and alloys and their compounds which consists in subjecting the to be treated charge comprising aluminum in admixture with a metallic oxide reducible by aluminum to a drying by heat for removing the hygroscopic or ordinarily present moisture in treatment preparatory to reduction.

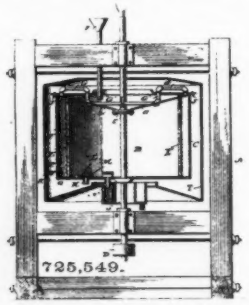
725,521. MILL FOR GRINDING.—Johannes C. Wegerif, Battlesbridge, England, assignor to the Renfrew Crusher Company, Limited, London, England. In a pan and roller mill in which the grinding rollers as well as the pan are positively driven and have their axes mounted non-radially to the pan axis, bearings at opposite sides of each roller in which the axis is mounted, the said bearings being loaded with yielding pressure applied directly to each bearing, both of the bearings for each roller being fitted to slide in fixed vertical guides.

725,533. APPARATUS FOR ANALYZING GASES.—Max Arndt, Aix-la-Chapelle, Germany. The combination with a gas suction and delivery mechanism, of a gas absorption apparatus arranged to receive gas from said suction and delivery mechanism, and means for automatically operating the suction and delivery mechanism and the absorption apparatus.

725,539. REGENERATOR FURNACE.—Grant Campion and Mott Wyant, Anderson, Ind. In a regenerator furnace, the combination with the regenerator chamber and the hearth of the lateral flue chamber, the slag pocket in the bottom of such chamber, the flues connecting said flue chamber and hearth, and the slag storage chamber below and communicating with said slag pocket.

725,548. PROCESS OF EXTRACTING COPPER FROM CARBONATE AND OXIDE ORES.—Henry R. Ellis, Salt Lake City, Utah. A process of extracting copper from its carbonate and oxide ores and from material carrying carbonate or oxide of copper, which consists in treating such ores or material with an aqueous solution containig a carbonate of soda or its described equivalent.

725,549. CENTRIFUGAL LIXIVIATING MACHINE.—Henry R. Ellis, Salt Lake City, Utah. In a centrifugal filtering machine, the combination of a rotary shaft, a drum mounted thereon, a perforated partition within the drum,


725,549.

arranged concentrically with the periphery of the drum and located at such distance therefrom as to form an anuular chamber about the perforated partition, a filtering medium on the inner face of the perforated partition, radial supply tubes communicating with the annular chamber near its top and means for supplying liquid to the supply tubes.

725,553. PROCESS OF CLEANING SODA.—Daniel W. Gill, Cheyenne, Wyo. A process of cleaning natural soda which consists in dissolving the soda in water heated to a temperature of about 160° F., letting the temperature fall to about 140° F., retaining at such temperature until the foreign matter has separated from the soda, drawing same off, and recrystallizing the soda at a temperature of about 50° F.

725,558. ELECTRICALLY DRIVEN CENTRIFUGAL BLAST FAN.—Hermann K. Grull, Vienna, Austria-Hungary. The combination of a shaft, a fan carried by said shaft, radial arms carrying said shaft, an electromotor, and an annular mounting plate, said arms and the field magnet of said electromotor being carried by said plate.

725,568. COUPLING FOR WELL DRILLING MACHINES.—Horace G. Johnston, Corsicana, Tex., assignor of one-half to William P. Sturm and Jacob W. Sturm, Corsicana, Tex. A device comprising a ring forming a body portion, a flange extending downwardly therefrom and formed with exposed threads, a guard at the end of said flange, and a guard flange extending from the main body portion and projecting beyond the plane of the threads and co-acting with said guard at the end of the first mentioned flange.

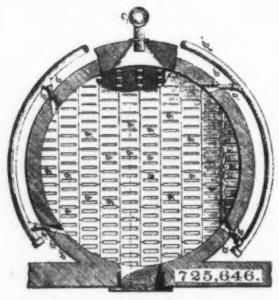
725,573. BUCKET CONVEYER.—Augustus L. Le Grand, West Pittston, Pa. The combination with a conveyer chain of a series of pivotally supported buckets carried by the chain, and means for automatically increasing the separation of the bucket supports by the flexing of the chain in either direction.

725,609. ORE SEPARATOR.—John W. Wolfe, Randolph, Iowa. In a separator, the combination with a tank adapted to contain liquid, of a submerged hopper therein, and a vibrating collecting pan in the tank under the hopper, covered by a convex separating sieve which is close to the lower edge of the hopper, forming a narrow escape opening there between.

725,641. APPARATUS FOR PREPARING MINERAL INGREDIENTS OF BITUMINOUS-MACADAM OR OTHFR PAVEMENTS FOR USE.—Horace W. Ash, Cambridge, Mass., assignor to Warren Brothers Company, Boston, Mass. Improved apparatus for preparing mineral ingredients of pavements comprising a rotary drying and heating drum, means for feeding the ingredients thereto and for automaticaly delivering them therefrom, a rotary grading screen and a mixer.

725,642. APPARATUS FOR GRADING MINERALS.—Horace W. Ash, Cambridge, Mass., assignor to Warren Brothers Company, Charleston, W. Va., and Boston, Mass. An improved apparatus for preparing mineral ingredients of pavements consisting of a rotary screen comprising a cylinder made up of sections, each section having perforations of a given size, with means for delivering the ingredients which pass each set of perforations into a separate bin, each bin having an outlet at its bottom and a separate gate for each outlet.

725,646. COKING OVEN.—Robert S. Moss, Chicago, Ill., assignor to L. Z. Leiter, Chicago, Ill. In a coking oven, the combination with the coking chamber, of a series of air


725,646.

discharging apertures or openings in the wall of the oven each aperture or opening having a lateral inclination tangential to the horizontal plane of the side wall of the oven for projecting air into the coking chamber at a lateral angle and giving a circulation thereto circumferentially around and within the coking chamber.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending March 28, 1903.

4,767 of 1902. ORE-JIG.—F. Baum, Herne, Germany. In an ore-jig, arrangements for passing off the larger pieces of gangue at once so as to prevent formation of slimes by attrition.

7,091 of 1902. MAKING GOLD WIRE.—A. D. Pennellier, London. Making gold wire with a core of solder, so that in making chains, rings, etc., it will not be necessary to apply solder separately.

7,352 of 1902. ELECTRIC SMELTING OF IRON ORES.—R. W. Wallace, London. In the electric smelting of magnetic iron ores, using anodes made of blocks of magnetite and carbon, which last longer than usual anodes.

7,893 of 1902. ORE-BREAKER JAWS.—W. H. Baxter, Leeds. Special chills for casting the jaws of ore-breakers.

8,300 of 1902. PRODUCING NITROGEN COMPOUNDS.—W. Ostwald, Leipzig, Germany. An improved process for producing catalytically oxides of nitrogen from ammonia and oxygen without the formation of nitrogen.

9,312 of 1902. COAL CRUSHER.—M. H. Grundig, Chemnitz, Germany. A stamp for crushing coal fed to coke ovens.

9,885 of 1902. ELECTRIC DRILL.—A. H. Gibson, Krugersdorp, Transvaal. Improved electric rock drill designed for compactness and lightness.

25,894 of 1902. CONCENTRATOR.—American Concentrator Company, Joplin, Miss. Improved method of varying the length and strength of the plunger stroke in jigs.

28,925 of 1902. ZINC SULPHIDE PRODUCTION.—Waring Chemical Company, Webb City, Miss. Producing zinc sulphide from sulphate by precipitating with sulphuretted hydrogen in dilute solutions.

771 of 1903. ELECTRIC DRILL.—H. B. Edwards, Wakefield. Improved electric gear for driving percussive rock drills.

ANNOUNCEMENT.

We find it desirable to state that the company owning THE ENGINEERING AND MINING JOURNAL has not purchased and will not purchase *The Pacific Coast Miner*, with which publication intimate relations have been maintained for the past four months. The ENGINEERING AND MINING JOURNAL is in a particular sense the organ of the mining and metallurgical professions of America, and while we wish well to all those who are doing good work in their respective fields of activity, it is found inexpedient to form an alliance with any local paper anywhere.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of THE ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL and making its office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers non-resident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution and thus enjoy the advantages of temporary office accommodation in the city of London.

PERSONAL.

Mr. R. A. F. Penrose was in San Francisco, Cal., last week.

Mr. George H. Robinson, of Salt Lake, Utah, is in New York City.

Mr. H. C. Beeler has been re-appointed State Geologist of Wyoming.

Mr. T. E. Schwarz, of Denver, has left New York City for Parral, Mex.

Mr. Courtenay de Kalb, of Boston, has gone to California on consulting work.

Mr. W. C. Wynkoop is now manager of the Liberty Mine, near Tonopah, Nev.

Mr. Samuel A. Parnall, of Mexico, is in the Lake Superior copper district on a short visit.

Mr. Newton Dunyon is now in charge of the Daly-Judge Mine and mill at Park City, Utah.

Mr. William Russell has passed through New York on his way from Glasgow to Denver, Colo.

Mr. Walter H. Weed, of the United States Geological Survey, has gone to Guanajuato, Mex.

Mr. J. H. Shockley reached New York City last week en route from London to Tarapaca, in Peru.

Mr. J. W. Stearns, district manager for the Westinghouse Company, at Denver, is in New York City.

Mr. R. A. Hadfield, the distinguished metallurgist, of Sheffield, England, arrives in New York City next week.

Mr. W. M. Gibson, assistant superintendent of the Calumet & Hecla Mine, recently visited Boston, Mass.

Mr. Martin Effinger, of Salt Lake City, Utah, has been in the Lake Superior copper district for a few days.

Mr. Carl Koelle is now in charge of the smelter of the Compania Metalurgica Mexicana, at San Luis Potosi, Mex.

Mr. A. B. Frenzel, of Denver, Colo., expert on rare earths, has been in New York City on his way to Germany.

Mr. Edward H. Liveing is consulting engineer to the Iron Duke and Associated Mines at Kalgoorlie, West Australia.

Mr. Bedford McNeil, according to report, has been appointed consulting engineer to the Rossland-Kootenay Company.

Mr. C. M. Van Cleve has been appointed manager of the smelter of the Penoles Mining Company at Mapimi, Mex.

Mr. Charles S. McKelvey, of Los Angeles, Cal., has resigned as president of the California-Nevada Mining Company.

Mr. J. B. Brown, mining engineer of St. Louis, Mo., has just returned from inspecting properties in Arizona and Idaho.

Mr. J. F. Brandes, mining engineer of Denver, Colo., left for New Mexico to examine some copper properties for New York parties.

Mr. Charles B. Kingston sailed on April 18 by the *Ivernia* on his way to take charge of important properties in northern Italy.

Mr. J. E. Spurr, of the United States Geological Survey, has gone to Tonopah, Nev., to complete his investigations of that region.

Mr. James I. Cowan, of Denver, was in New York City during the week, having come from the City of Mexico, via Vera Cruz.

Dr. Theo. B. Comstock, of Los Angeles, Cal., has returned from an examination of mines in the States of Chihuahua and Durango, Mex.

Mr. Carl Eilers, of Denver, Colo., has resigned his position as one of the managers of the American Smelting and Refining Company.

Mr. E. L. Bruce has been appointed assistant purchasing agent of the Colorado Fuel and Iron Company, with office at Denver, Colo.

Mr. Andre P. Griffiths, general manager of the Palmarejo Mine, at Chinipas, Chihuahua, Mex., will be in New York City about May 8.

Mr. D. H. Peery, president of the Salt Lake Stock and Mining Exchange, recently returned to Salt Lake from a trip to Honolulu.

Mr. P. G. Lidner, who recently returned to New York from Siberia, where he went on behalf of Mr. J. B. Haggin, has now gone to Mexico.

Dr. Alfred Simon, who has been investigating coal mining methods in Pennsylvania, left for London by the steamer *La Champagne* on April 23.

Col. E. F. Phelps, of New York City, is in the Lake Superior copper district in the interests of the United Mining and Development Company.

Mr. R. K. Humphrey, of Denver, Colo., succeeds Mr. Emerson Gee as superintendent of the California King Gold Mines Company, at Picacho, Cal.

Mr. J. P. Evans, of the Colorado Iron Works Co., is superintending the construction of the new mill of the Mojave Gold Mining Company, 7 miles south of Needles, Cal.

Mr. Hal. W. Hardinge has been in Boston, Mass., on professional business, and has now returned to Denver, to carry out important concentration tests on Mexican ores.

Mr. C. C. Higgins, superintendent of the Capital City Gold Mining Company, developing the Baby Mine, near Grant's Pass, Ore., will remain at the mine until the fall.

Capt. James Wilcox, superintendent of the Mass Consolidated copper mine at Mass City, Mich., is at Bisbee, Ariz., in the interests of the Portage Lake & Bisbee Mining Company.

Mr. W. A. Bateman, of Calumet, Mich., has recently returned from Cochise County, Ariz., where he secured a large group of claims in the Huachuca Mountains for Lake Superior men.

Mr. F. W. R. Snyder, formerly of the Illinois Steel Company and the American Bridge Company, has accepted a position as sales agent for the Tidewater Steel Company, of Chester, Pa.

Mr. Henry L. Leahy has resigned his position as asuperintendent at the Massillon, O., Coal Mining Company's mines and accepted an offer of the South Massillon Coal Company in the same capacity.

Mr. Frank Blackwell, of Calumet, Mich., has been appointed to succeed Mr. H. Z. Brock as superintendent of the Northwestern Development Syndicate's gold property in the Lardeau District of British Columbia.

Dr. Joseph Struthers, associate editor of the ENGINEERING AND MINING JOURNAL, delivered a lecture on "The Cyanide Process" before the graduating class of the Columbia University School of Mines, on April 21.

Mr. R. H. Aldrich, chief engineer of the pump department of the Allentown, Pa., Rolling Mills, and inventor of the Aldrich electric pump, passed through Denver a few days ago on his way East after installing a plant at Butte, Mont.

Mr. Arthur W. Jenks, for three years superintendent of the smelting department of the Compania Minera de Penoles, Mapimi, Durango, Mex., has resigned to accept the position of general manager of the White Knob Copper Company at Mackay, Idaho.

Mr. Arthur S. Dwight has been appointed consulting engineer and metallurgist to the Greene Consolidated Copper Company, at Cananea, Mex. Mr. Dwight sailed by the *Vancouver* on April 22 with the purpose of visiting Rio Tinto, Mansfeld, and other important copper mines in Europe. He will be absent about two months.

Mr. Don H. Bacon, chairman of the Executive Board, and Secretary L. T. Beecher, of the Tennessee Coal, Iron and Railroad Company, accompanied by several directors of the company, are making a personal inspection of the properties in Alabama. Among the party are Messrs. Cord Meyer, S. L. Schoonmaker, J. T. Woodward, Benjamin F. Tracey, Joseph B. Dixon and Frank S. Witherbee.

Mr. John Knox, of Houghton, Mich., assistant superintendent of the Trimountain Mine, has accepted the superintendency of the Eva group of mines in the Lardeau District of British Columbia. Mr. Knox is a graduate of the Michigan College of Mines, and has been with the Trimountain Mining Company for the past three years. The Eva group is owned by the Calumet & British Columbia Gold Mines Company.

OBITUARY.

Henry B. Gillespie, founder of the town of Aspen, Colo., and discoverer of the famous Mollie Gibson Mine, died on April 19 in Parimaribo, Dutch Guiana, where he was interested in mines. With the discovery of silver in Aspen Mountain in 1879, Mr. Gillespie took 25 miners across the range on snowshoes to develop the new country. He named the town, and during his absence in Washington, D. C., the town site was jumped and the name changed to Aspen. From the Mollie Gibson Mine he is said to have taken $5,000,000. He had much success with other properties at Aspen, but sank most of his profits in silver mines, which failed to pay after 1893. He also founded the Mining Exchange of Denver.

SOCIETIES AND TECHNICAL SCHOOLS.

MCGILL UNIVERSITY.—The departments of mining engineering and metallurgy will be separated. Prof. Stansfield will have charge of the metallurgical department, while Prof. Porter will continue to direct that of mining engineering.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—The first meeting of the mechanical section, held recently, was well attended. A paper on "Coal Handling Machinery in Power Plants" was read by T. F. Webster, manager of the Pittsburg office of the Link-Belt Engineering Company, and Dodge Coal Storage Company, Philadelphia. The paper was illustrated by lantern slides, showing the operation of different systems. The next meeting of the section will be held May 11, when a paper on "Power Plant Design" will be read and illustrated by R. W. Stovel, of Westinghouse, Church, Kerr & Co. The three sections of the society met at the Frick Building, Pittsburg, on April 18 to inspect the building.

COLLEGE OF THE CITY OF NEW YORK.—Dr. John H. Finley, professor of politics at Princeton University, has been elected president of the College of the City of New York. Before the election of President Finley the resignations of Solomon Wolff, professor of drawing, of R. Ogden Doremus, professor of chemistry, and James Wier Mason, professor of mathematics, were read and accepted.

President Finley was born near Galesburg, Ill., in 1863, and was graduated from Knox College in that city in 1887. After a post-graduate course in history and economics in Johns Hopkins University, he became secretary of the New York State Charities Aid Association. In 1892 he became president of Knox College, his own alma mater. In 1899 he was called to a newly established chair of politics in Princeton.

INDUSTRIAL NOTES.

The Wood Drill Works, of Paterson, N. J., are shipping rock drills to Isaac M. Hutchinson, Mexico City.

The Chicago Pneumatic Tool Company has secured a fair-sized order for pneumatic tools for shipment to the Chinese Imperial Buildings.

The Weber Gas and Gasoline Engine Company, of Kansas City, Mo., reports business showing a good increase over corresponding months of last year.

Contracts are shortly to be awarded by the Jones & Laughlin Steel Company, of Pittsburg, Pa., for the erection of two more blast furnaces at the Eliza plant.

Messrs. Dodge & Day, modernizing engineers of Philadelphia, Pa., are installing a new shop management system in the works of the Link-Belt Engineering Company.

The American Blower Company has recently opened an office in the Hale Building, Philadelphia, Pa., in charge of Benjamin Adams, and another in the Frick Building, Pittsburg, Pa., in charge of H. P. Curtiss.

The new plant of the Susquehanna Iron and Steel Company, at Columbia, Pa., will have a capacity of 150 tons daily of lapweld pipe from 2 to 10 ins. It will cost about $600,000, and have electrical equipment throughout.

A Cassel water motor of 25 h.p. has been completed at Seattle for an electric plant at Sedro-Woolley, Wash. This motor will make 900 revolutions a minute, and will drive under 550 ft. head a Stanley electric generator.

At the annual meeting of the directors of the Keystone Drill Company, at Beaver Falls, Pa., recently a committee of three was appointed to decide whether the company should rebuild those departments ruined by fire or remove the whole plant to another place.

The Pittsburg Feed Water Heater Company, of Pittsburg, Pa., has elected the following directors and officers: James Bonar, president; J. E. Schlieper, treasurer and general manager, and Joseph Cawley, secretary. The company has just removed its offices to the Frick Building.

The Baldwin Locomotive Works recently sent the Burt Manufacturing Company, of Columbus, O., its 16th order for exhaust heads. The Pittsburg Steamship Company, controlled by the United States Steel Corporation, has ordered of the Burt Company a large oil filter for use on one of its steamers.

The Stanley Electric Manufacturing Company, of Pittsfield, Mass., has sold 32 38 h.p. and 20 50-h.p. street railway motors to the Sheboygan Light, Power and Railway Company, of Sheboygan, Wis., also a 750-kw. engine type railway generator to the Trenton Street Railway Company, Trenton, N. J.

The N. Thompson Company, of Vancouver, B. C., a newly organized engineering company, with N. Thompson, late of the Albian Iron Works, as president, is occupying its new shops, 50 by 240 ft., and is building mining and marine machinery. The firm will probably soon open a branch in Victoria.

The Northwestern Iron Works, of Seattle, Wash., Theodore Kelsall manager, have moved into new and larger quarters on First Avenue South, near the Moran Shipbuilding Works. The company is manufacturing mining machinery, and builds the Cassel water motor and the Parker rotary mill on contract.

The removal of the nickel refining plant of the Orford Copper Company, at Bayonne, N. J., to Constable Hook will be completed this month. A new plant has been erected in the yard of the copper works at the Hook. The old plant is at a considerable distance from the main works. About 150 men will be employed in the new plant, working a day and a night force.

Takata & Co., with offices at 10 Wall Street, New York City, have secured a contract for the equipment of a short narrow-gauge electric traction system in Japan. The contract calls for equipments to be manufactured by the Westinghouse Electric and Manufacturing Company; overhead material furnished by the H. W. Johns-Manville Company, and crown bonds from the American Steel and Wire Company.

The Differential Ore Crushing Company, Grand Rapids, Mich., with a capital of $500,000 common and $50,000 preferred stock, has been incorporated to manufacture all kinds of ore crushing, grinding, pulverizing, separating and mining machinery. The management is vested in Thomas W. Strahan, chairman; Frank B. Chapin, treasurer; Lorenzo D. Steward, secretary; and Ben M. Corwin and Frank A. Lamar.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Company in Jersey City on April 20 the old board of directors, consisting of Edward F. C. Young, John A. Walker, William Murray, Joseph D. Bedle, Edward L. Young, Geo. T. Smith and George E. Long, was re-elected. President E. E. C. Young, Vice-President and Treasurer John A. Walker, and Secretary George E. Long were re-elected by the directors.

The M. Garland Company, of Bay City, Mich., has shipped to the Otter Creek Lumber Company, Otter Creek, Fla., a combination bolter and sawing machine, arranged with variable friction feed; a gang bolter for converting slabs and trimmings into staves and heading; also a 2-saw stave equalizer for sawing staves to length, and a Garland's patent rotary head stave jointer. The three machines make a complete equipment for a first-class stave mill.

At the meeting of the directors of the Allis-Chalmers Company in New York City on April 15, the regular quarterly dividend of 1¾ per cent was declared on the preferred stock. The company states the volume of business on its books to-day far exceeds that of any time since its organization, notwithstanding the fact that the output of the plants has been largely increased. The company can see no abatement of prosperity in its various lines of manufacture. There seems to be an unlimited demand for all kinds of high-grade machinery.

The Plunger Elevator Company, of Worcester, Mass., reports the following recent sales among others: Two passenger elevators, with a travel of 103 ft. and 1 freight elevator, with a travel of 114 ft., for the Victoria Hotel, New York City; 4 elevators, car travel 114 ft., for the State Mutual Life Insurance Building, Worcester; 6 elevators, with a travel of 125 ft., for the new building of the State Mutual Life Insurance Company, Boston; and a car lift with a travel of 25 ft., and a capacity of 60,000 lbs., for the car barn of the Worcester Consolidated Street Railway Company.

The Eastern Steel Company, which is spending a large amount of money in the construction of a steel plant at Pottsville, Pa., has as directors James A. Burden, Jr., Charles G. Wetmore, William G. Park, George W. Young, Archibald White and George Sheldon, of New York City; William H. Shelmerdine, William S. Pilling, and Theron I. Crane, of Philadelphia, Pa.; W. H. Gibbons, of Coatesville, Pa.; J. P. Jefferson, of Warren, Pa.; and Robert Jennings, of Jersey City, N. J. The officers are: W. H. Donovan, president; P. R. Foley, treasurer, and W. J. Bassett, secretary.

The C. O. Bartlett & Snow Company, of Cleveland, O., has just received an order from the Schwartzkopf Coal Dust Firing Syndicate, of Haydock, England, for a No. 3, style C grill, 4-compartment dryer for drying coal. The Schwartzkopf Company has spent a great deal of money in getting a first-class dryer, and sent its special agent to the United States to investigate the merits of the dryer purchased after the most rigid examination. The C. O. Bartlett & Snow Company has orders from Wood & Swart, Denver, Colo., and the Payne Consolidated Mining Company, of Sandon, B. C., for dryers.

The Illinois Steel Company has bought 33 acres of land at Indiana Harbor, near Chicago, Ill., as a site for a Portland cement plant, on which work is to begin immediately, to cost, when completed, $3,000,000. The new works are to be known as the Buffington plant, and will have a capacity of 4,000 bbls. of cement a day. The buildings will include a raw material building 180 by 130 ft., 2 storage warehouses with a capacity of 400,000 bbls., and miscellaneous buildings. The plant is to be completed by April 1, 1904, and will employ about 500 men. The United States Steel Corporation now has a plant at South Chicago, with a capacity of 2,000 bbls. a day.

The Passaic Steel Company, which acquired the plant of the Passaic Rolling Mill at Paterson, N. J., has prepared plans and given contracts for a new steel plant in connection with the existing plant. The plants call for 12 50-ton open-hearth furnaces, a blooming mill, a finishing structural mill with gas producers, coal storage plant, boiler house and power plant, with a total capacity of 300,000 tons per annum of finished structural steel shapes. The contract for the electrical cranes was given to the Morgan Engineering Company, of Alliance, O., the contract for the electrical work to the Westinghouse Company, while the engines will be built by the Buckeye Engine Company, of Salem, O.

TRADE CATALOGUES.

Circular No. 35 sent out by the Chicago Pneumatic Tool Company, of Chicago, Ill., illustrates the company's long, strong stroke riveting hammers, its chipping, calking and beating hammers, and its Little Giant and Boyer air drills.

The Webster, Camp & Lane Company, of Akron, O., issues a little circular, calling attention to the performance of a special design horizontal turbine unit installed at the plant of the Michigan Lake Superior Power Company at Sault Ste. Marie, Mich., where are now 42 of these units.

Luxfer prism sky-lights for distributing light through a large room, as in stores and office buildings, mills, factories, warehouses, etc., are described in the pamphlet issued by the American Luxfer Prism Company, of New York City. The company also makes sidewalk vault lights fitted with luxfer prisms.

An artistic pamphlet containing some remarkably fine illustrations is published by the Niles-Bement-Pond Company, of New York City. It describes that company's adjustable, multi-spindle drilling machines which include not only standard heavy multiple drills for railroad and general work, but also several machines of Pratt & Whitney Company's design for drilling duplicate parts in light work.

A 54-page catalogue issued by the Carterville Foundry and Machine Works, of Carterville, Mo., and the Galena Iron Works, of Galena, Kans., describes the work done by the two companies in supplying the lead and zinc mines of the Joplin District with concentrating machinery, and gives prices of the Carterville cornish rolls, the Carterville centrifugal pump, and also of jig grates and other supplies.

Illustrated circulars sent out by the Goheen Manufacturing Company, of Canton, O., calls attention to the merits of the company's carbonizing coating, recommended for use on railway bridges, on iron in buildings, on steel smokestacks and boiler fronts, and wherever iron and steel work is exposed to sulphur fumes or acids, as about smelters and mills. The company guarantees that an American gallon of carbonizing coating will cover 1,000 sq. ft. of clean metal surface with one coat.

A finely illustrated catalogue of artistic appearance is issued by the New York Belting and Packing Company, of New York City. It is entitled "Mechanical Rubber Goods," and describes the company's rubber belting for power transmission or conveying purposes, as well as the company's rubber hose. The latter includes air transmission hose for drills and pneumatic tools, metal strengthened suction hose and fire-hose of several styles. The company manufactures sheet-packing, Cobb's spiral piston packing, Magic cushion packing, Amazon hydraulic packing, and elastic expansion ring packing, also pump valves, valve discs, sheave fillings and vulcanite emery wheels.

SPECIAL CORRESPONDENCE

Denver. April 18.

(From Our Special Correspondent.)

On April 13 the Colorado Mine Operators' Association at its annual meeting in Denver elected the following officers: President, E. A. Colburn, president of the Ajax Gold Mining Company, Cripple Creek; vice-presidents, Lafe Hanchett, general manager of the Argo Mining, Drainage, Transportation and Tunnel Company, at Idaho Springs; T. Walter Beam, president and general manager of the Japan Mines Company, at Telluride; Seeley W. Mudd, general manager of the Small Hopes Consolidated Mining Company, at Leadville; secretary and treasurer, W. E. Pasmore, of Denver. These officers constitute the executive committee. The membership of the association is increasing.

The executive committee of the Idaho Springs Union of the Western Federation of Miners has notified the managers of some of the mines that "as the General Assembly failed to pass the 8-hour law, that on and after May 1, 1903, all mines operating within the jurisdiction of the Idaho Springs Union will be required to work 8 hours, the men to go to work on their own time and come out on company time. This notice is believed to show the course proposed by the Western Federation of Miners in those mining districts where the 8-hour system does not already prevail. The 8-hour system is in operation at Cripple Creek, Silverton, Telluride, Creede and Lake City.

The Boston & Colorado Smelting Company at Argo, near Denver, on April 15, increased the price it will pay for mine tailings from $4 to $6 per ton on all ore running $9 per ton or less. On ore running from $9 to $20 per ton the treatment charge is reduced to $3 per ton; on ore running from $20 to $35 per ton the treatment charged is reduced to $3.50 per ton; and on ore running over $35 per ton, the charge will be $4 per ton. These are all material decreases on previous charges, except the last, which is an increase of 25c. The schedule is based on 10 per cent of silica in the ores. For every 1 per cent in excess of 10 per cent an additional charge of 10c. per ton is made. It is also based on a 5 per cent zinc showing and 30c. per ton is added for every 1 per cent above 5 per cent zinc. The schedule applies to car-load lots delivered at Argo.

The new schedule was made to stimulate the production of low-grade ores in sections tributary to the Argo Smelter, and was prepared after consultation with a number of prominent mine operators in Gilpin and Clear Creek counties. The smelter paying $2 per ton more for tailings, at $6 per ton the miners will be able to make a profit on what would otherwise go over the dump. In Gilpin and Clear Creek counties the quantity of low-grade ore in sight is very great, and the local mining industry will be much benefited.

The Colorado Society of United States Deputy Mineral Surveyors, with headquarters in Denver, proposes to take up a test case, presenting all phases of the question involved in the decision of the Commissioner that patented mineral claims are where they are described in the official deed, irrespective of where they actually are on the ground. It is held by the society that danger and confusion follow this decision; that the decision tends to evoke litigation, makes certain unpatented tracts unavailable and throws other patented tracts open to the public.

The society further holds that so long as the present ruling of the Commissioner is in force, there can be no assurance that an individual can patent such ground as he has otherwise a right to patent and no assurance that some one else will not procure a patent intentionally or unintentionally to ground owned by another under a patent.

The society desires to get a reversal of the decision and present practice of the department, and a resumption of the practice, which existed prior to June 20, 1899, of showing patented claims as they exist upon the ground. A test case is now before the Commissioner.

San Francisco. April 13.

(From Our Special Correspondent.)

The expected has happened, many miners in Amador County, with some in Calaveras County, have gone on strike, and several mines have closed. Such large properties as the Kennedy, Oneida, Central Eureka, South Eureka and Zeila at Jackson and the Gwin Mine Development Company are affected as is the Wildman-Mahoney at Sutter Creek. The notice

posted at the mines on April 13 declares the strike to be for recognition of the union, 8 hours to constitute a day's work, the reinstatement of men previously discharged for affiliating with the union, and the right to trade and board where each one desires. There was no direct demand for increase of wages.

As soon as the strikes occurred at Keswick, Shasta County, and at Hayden Hill, Lassen County, the mine owners on the Mother Lode began preparations for defense, and the Mine Operator's Association to present a united front to the Western Federation of Miners, as the association resolved not to discriminate between union and non-union miners at any of the mines, and the miners demand recognition there is a contest which will work disastrously to the interests of the Mother Lode counties—Amador, Tuolumne, El Dorado, Calaveras and Mariposa. So far the strike has been confined to the lower part of Amador County, south of Sutter Creek, and over the Calaveras County line to the Gwin Mine. But it is expected that the miners will include the Keystone, Lincoln, Bunker Hill, Fremont, Bay State, Shenandoah and many others in the northern part of the county. Several of the larger companies with offices in San Francisco, have telegraphed to superintendents to notify the men to return to work or call for their pay. Most of the men drew their wages, though many declared they would return if the union would permit.

The mine owners state that they will make no attempt to import men, but if the miners do not return to work on the old basis the mines will be closed, except for the pumping plants. Few of the mines affected are paying dividends. At the Kennedy and Fremont large expenditures have recently been made for new machinery etc, The region included is a "low-grade" one, and the mines work on a narrow margin of profit. The strike is the worst blow the gold mining industry has had since the closing of the hydraulic mines years ago. There are between 1,200 and 1,500 miners in Amador County alone, without counting surface men, etc.

Lands along the Yuba River, near Marysville, is becoming of value for gold dredging, and those interested hope that in time the region will be as important as Oroville, Butte County. Some of the big ranches have lately been bought or bonded by men who intend prospecting for gold. W. P. Hammon, of Oroville, will shortly have dredgers at work on the Yuba. Senator Digs has given an option on his land just below the site of the last of the proposed restraining dams. It was never supposed that these lands were of any especial value because so much mining debris came down before hydraulic mining was stopped.

The California State Mining Bureau reports to the Governor that it has now in the museum over 1,600 type specimens of ores and minerals, and that constant additions are being made by voluntary contribution. Over 60,000 persons registered as visitors to the mineral collection last year, and as many more came who failed to register. Hundreds of persons daily visit the museum and library.

The Inland Crystal Salt Company, of Salt Lake, controlling the markets of Arizona, Wyoming, Idaho, Montana and part of Oregon and Washington, has advanced the price of salt from $5 to $9 per ton for coarse, with higher rates for better qualities. The Federal Salt Company, of San Francisco, which controlled the California product, has gone out of business as the result of Government suits against it, but a new corporation has taken its place in order to raise prices to a "profitable point."

An interesting suit has been decided by the Judge of the Superior Court of Plumas County. Carrie L. Ross located a placer claim of 80 acres, which included a small lot of land occupied for 16 years by Stephen Dean. Among the names of the locators was one John McMullen, who testified that he never really owned any interest in the claim, but that his name was simply borrowed to satisfy the law. The court held that had the Ross location been valid, Dean's right by settlement would fail, and the subsequent mineral location would have the better title, but as the borrowing of names for making extensive locations is a fraud upon the Government, the Ross location was void in toto. The practice is very common, but the principles of the decision have been before laid down by higher courts, and if the facts are developed, in a contest for title, such locations would be declared void.

San Luis Potosi, Mex. April 14.

(From Our Special Correspondent.)

The coming of Mr. John Hays Hammond to Mexico as consulting engineer of the Guggenheim Exploration Company is causing much speculation. Since Mr. Hammond is connected with the Venture Corporation, of London, in which the Rothschilds are large holders, and since the Rothschilds have purchased considerable stock recently issued by the Guggenheim Exploration Company, some people here wonder if the Rothschilds are to absorb the Guggenheim interests. This would be an enormous undertaking, as the Guggenheims not only have interests in the American Smelting and Refining Company, but their mine holdings in Mexico represent many millions, and they are now after the mines of the Hidalgo Mining Company at Parral, where the recent gold strike was made.

Fairly good authority states that the American Smelting and Refining Company has bought the San Luis Potosi Smelter of the Compania Metalurgica Mexicana, but I believe this is only a rumor growing out of the fact that Mr. Robert L. Towne and Mr. Simon Guggenheim left New York on the same train a few weeks ago. The Compania Metalurgica Mexicana has mines at Santa Barbara, Sierra Mojada, Sombrerete, Fresnillo, San Luis Potosi, Monterey and other points, which can furnish enough ore to keep the smelter going. Mr. Towne is at present in Santa Barbara, looking after the improvements there, and Mr. Carl Koelle, the new superintendent of the smelter, arrived at San Luis Potosi April 14.

E. L. Doheny, president of the Mexican Petroleum Company, reports good progress near Ebano, Vera Cruz, where over $500,000 gold has been expended in the last year, putting in a refinery, storage tanks, pipe line, railroad, wells, etc. The Waters Pierce Oil Company is prospecting at several places in Tampico and Vera Cruz. In the latter State oil has been struck on the ground of the Vera Cruz & Pacific Railroad, and also near the line of the Mexican Railroad. In Coahuila considerable prospecting for oil is going on, while from the Macuspama fields in the State of Tabasco come reports that gushers have been struck.

In the States of Michoacan, Guerrero, Puebla and Oaxaca are being found many ore-bodies, which for small investments can be put on a paying basis. J. W. Childers has been taking machinery 200 miles into the interior of Michoacan, for the Carrizal Gold Mining Company to work 1½ oz. gold ore, and the English syndicate operating at Ananguilio, Michoacan, is shipping in mining and milling plants. In Guerrero the work of the Mitchell Mining and Smelting Company on La Dicha mines, near Chilpaucingo, is attracting many prospectors. On the Pacific coast of these States are placers, which in a few years will begin to show in the gold production of Mexico.

The new line of the National from Rincon to Guanajuato will connect San Luis de la Paz and Pozos with Guanajuato, and give better transportation facilities to El Cubo, Santa Rosa, and San Anton de las Minas. At the last named camp last December the Dolores Mining and Milling Company started work. This company has head offices in Boston, Dwight Furness, of Guanajuato, is managing director, and W. N. Cummings, general superintendent of mines for the Dwight Furness Company, is consulting engineer. The properties were originally worked by the Providencia Mining and Milling Company, W. E. Butcher manager, and later by the San Anton Mining and Milling Company, with L. W. Tatum manager. The company is working 2 cross systems of argentiferous quartz fissure veins, and sinking a new 4½-ft. by 9-ft. 2-compartment shaft 500 ft. to strike the ore found by the old workings. The company has a 10-stamp combination concentrating and pan-amalgamating mill, and is in shape to treat the ore when the shaft, now down 150 ft., is finished. W. E. Butcher is sinking a shaft on the Juanita claim, and organizing a company to renew operations on the Ave de Gracia claim, both of which are on one of the systems traversing the ground of the Dolores Company.

The past week being Holy Week, all business was practically suspended, and for the few days the banks were open exchange on New York fell from 261½ to 260⅜.

London. April 11.

(From Our Special Correspondent.)

An American wildcat of a particularly absurd type has made its appearance in London. This is the American Exploration Company, of Call Building, San Francisco, and Flat Iron Building, New York; the London agency is in Hotel Cecil Chambers. This company is offering 4 per cent cumulative preference shares in its subsidiary companies on the installment system, and the $25 shares may be obtained by subscribing 1s. a week. The commission given for placing shares is 15s. a share. The shareholder is also given an ordinary share as bonus, for every preference share subscribed for. The particular subsidiary company now being introduced is La Fiesta Gold Mining Company, incorporated under the laws of Arizona, capital $3,000,000 in 40,000 preference, and 80,000 ordinary shares of $25 par value. The properties to be acquired are the Lizard Group in Storey County, Nevada, and the Kanaka Group in Tuolumne County, California. The prospectuses and various circulars are full of the usual nonsense, but as readers of the JOURNAL are not likely to be investors in this sort of proposition, it is only wasting space to go into details. Such companies are continually cropping up in London, and the supply of inexperienced and credulous people is perennial.

A few months ago you published an article written by me on Mr. G. J. Atkins' process for the manufacture of hypochlorite of soda. Since then the process has been extensively developed commercially, and its uses widened. The company owning the process—Oxychlorides, Limited—is being supported by influential people, of whom Mr. G. W. Wolff, of Harland & Wolff, is perhaps the best known. The £1 shares in the company are in demand at over £2, and 10,000 shares have just been subscribed for at this quotation. The process is being extensively adopted by paper makers who find thta the solutions will rapidly bleach such unpromising materials as peat; and the value of the solution as a deodorizer and disinfectant is also being recognized by eminent authorities. The directors intend to propose that the capital be increased from £100,000 to £150,000, and it is probable that the parties who have subscribed for the 10,000 shares above mentioned will take 10,000 more of the new shares. Altogether the process appears to be a promising one, and its present financial position is extremely satisfactory.

The Mikado Gold Mining Company, working the mine of that name in the Lake of the Woods District, Ontario, is about to be reconstructed with a liability of 5s. a share. It will be remembered that the recent report showed a debit balance owing to the poorness of the ore. It was intended to issue debentures in order to extinguish the debt and provide further working capital, but the subscriptions were not sufficient. There is therefore no alternative but to reconstruct. The company was formed originally in 1897, and in 1900 new shares were issued to provide further working capital. The only dividend paid was 5 per cent in 1900, so that it has not been a profitable speculation. No fault can be found with the management or direction, only with the nature and character of the veins.

An American mine that has for many years been worked from London, the Sierra Buttes, California, appears to have come to the end of its days. The Sierra Buttes Gold Mining Company was formed in 1870, and during the first seven years of its existence paid about £350,000 in dividends. Since then the mine has been continuously worked, but the profits have been very small, not amounting in the aggregate to more than £25,000. The average contents have gradually decreased, and during 1902, 9,127 tons were treated, yielding only $2.67 per ton, at a cost of $2.28. Since then the average contents have been less than that, and the directors propose to sell the property for what it will bring, which, of course, will be a mere trifle. In 1872 the company acquired the Plumas-Eureka Mine, which also paid handsome dividends in its early days, no less than £600,000 having been distributed. Of recent years the grade has been poor, but the administration has been extremely good, so that the balance has always been on the right side. Altogether these two mines have done well for their shareholders, and the direction and management have been everything that could be desired. The extremely low working costs are characteristic of the practice on the Mother Lode of California, but it is not often that London administration expenses are so low. The disappearance of the company is to be regretted for many reasons, and it is to be hoped that, with the reserve fund in hand, the directors may be able to acquire a new property.

A new company of considerable promise has just been formed here. This is the Oxnam Prospecting Company No. 1, Limited, which has been formed to investigate certain Mexican properties that belong to the Palmarejo & Mexican Gold-fields, Limited. It will be remembered that the latter company had a long record of mismanagement until three years ago. Mr. Southcott, the new chairman, and Mr. T. H. Oxnam, the new mining manager, effected a wonderful transformation. The original properties have been put into excellent shape, and are satisfactory producers, while the rest of the company's extensive properties have been partially looked over. The properties cover no less than 107 square miles, and all the ground is worth prospecting. The Oxnam Prospecting Company No. 1 has been formed to develop the most likely prospects. The capital is £40,000, of which only £20,000 is being issued now. There are no vendors' nor promoters' shares, and all the shares are issued for cash at par. Mr. Oxnam is to be the managing director, and the operations will be under his guidance. The shareholders in the Palmarejo and their friends have readily taken up all the shares issued.

Johannesburg, Transvaal. March 5.

(From Our Special Correspondent.)

Diamond Mining.—During the past few months there has been some activity here in diamonds, in the floating of diamond mining companies, in prospecting expeditions, etc.

The great supplier of the trade has been De Beers Consolidated, which from the start of operations to June 30, 1899, supplied 24,476,000 carats of diamonds. The United States has bought the greater part of this enormous output. Outside of the Kimberley District the only producer of any importance is Jagersfontein in the Orange River Colony, which up to March, 1901, produced 2,168,400 carats. There

have been diamond booms and rushes to other parts, and even before the war there was talk about diamonds in the Transvaal, principally in the Pretoria District, and the subject is now prominently before the public, there being a number of diamond propositions on the market, including the Regent Diamond Syndicate, Koalfontein Diamond Mines, Nucleus Diamond Syndicate, Imperial Diamond Syndicate, Elandshoek Diamond Syndicate, Leasfontein Diamond Mining Syndicate, Tweefontein Diamond Syndicate and the Premier Diamond Mines. There seems to be no trouble in getting people to go into these ventures.

The Premier Diamond Mine is attracting most attention. The last returns of the Transvaal show that some diamondiferous material is being obtained. The yield for the last half of 1902 was 759¼ carats, valued at £1,383, and for January, 1903, 718 carats, worth £1,279.

The Premier Diamond Mine is in the Pretoria District. The product found near the surface is reported as of little value, but it is hoped that depth will show better quality. This hope cannot be based on Kimberley experience, for increased value with depth does not hold there. It is said that the Premier Diamond Mine gets a return of 4 carats per load of material hoisted, worth about 20s. per carat. De Beers gets something like 76 carats per load, worth about 45s. per carat. If the Premier's figures are correct and there is a huge supply of diamondiferous material, worth 80s. per load, it is easy to see that it is a greater proposition than De Beers, worth 34s. per load.

I understand, however, that the diamonds being found at the Premier are small and inferior, a grade, in fact, which is very extensively produced by De Beers, but not placed on the market. If they saw fit to do so, they could sell this class of stuff at about 2s. 6d. per carat, so it is said.

It seems to me that the diamond industry of the Transvaal will have no effect on the great corporation of De Beers. Of one thing we may be sure, and that is, that De Beers keep a keen lookout for diamond prospects, and as far as known, they have taken little interest in the finds in the Transvaal, as yet.

Suppose, however, that a really valuable producer is found in the Transvaal. It is probable that De Beers would buy the mine outright, for with the enormous financial resources at their back they would be able to outbid every one. If the Transvaal mine was powerful enough to stand against them, it seems to me an understanding would be arrived at concerning the output of diamonds, and the prices paid for them. It would be a great mistake to flood the market with them. That master mind of South Africa, Cecil Rhodes, was economically right when he carried his policy of amalgamation of the Kimberley diamond interests into effect. The diamond industry is one of the enterprises of the world where the cruelest monopoly is justifiable in order to preserve the value of the article. If the world were flooded with diamonds to-morrow they would no longer claim the high esteem of men and women everywhere, but would no doubt be relegated to children as pretty toys to play with.

A drawback to the diamond industry in the Transvaal is the old law, passed by Kruger's influence, whereby the government becomes a very large partner in every diamond mine opened.

Every one hopes that the Pretoria diamond field will turn out well. If it should the quiet capitol would receive a great impetus, but all one can do is to wait patiently, remembering that with only the present data to go on it is safest to be a pessimist.

Sydney, N. S. W. March 14.

(From Our Special Correspondent.)

South Australia.—A boom is on in the Arltunga District of what is now called Centralia. The capital of one company was rushed up to £90,000, though the claim was practically unexplored. It takes a fortnight to reach Arltunga from Adelaide, and rail and coach fares cost $71, first-class, single, and $60.50, second. One travels 688 miles to Oodnadatta, the present terminus of the South Australian transcontinental railway, and then drives a little over 400 miles, passing through Alice Springs, where there is a telegraph station, the gold-field being 65 miles to the northwest, in the "never never" country. Some of the stages are hard pulling through sand, and a good load for each horse drawing a wagon is 500 lbs., but the bulk of the carrying is done by camels that take an average load of 400 lbs. each, and occupy 21 days for the trip, the cost being $48 per ton. Several well known mining men have lately gone to the field.

After many fluctuations the Wadnaminga goldfield in the neighborhood of Teetulpa, has been abandoned. The quantity of gold secured has been fairly large, but lack of water has compelled prospectors to forsake promising shows.

At Aryepina, about 45 miles from Leigh Creek, work has again started on the old Treasure Mine leases. A trial lot of stone treated at the Mount Torrers battery gave 4½ oz. per ton, and good prospects have been obtained by dollying along its outcrop.

Queensland.—At Smith's Creek, the Proprietary Tin Mine has completed its dressing plant and the concentrators are running smoothly; 150 tons have been crushed for a return of 7 per cent tin oxide.

The Mount Morgan Mine has paid another monthly dividend of 3d. per share, representing £12,500.

The output in the Ravenswood District for 1902 was 53,000 oz. of gold, with every prospect of its increasing this year. The New Ravenswood Company yielded gold of the value of £49,676 in 1902, the last half yearly dividend was 30 per cent, and it is proposed in the future to pay quarterly dividends of 25 per cent. Last year's operations on the General Grant property gave £90,000 worth of gold.

The January yields for Charters Towers were 17,020 tons crushed for 17,014½ oz. gold, and 20,695 tons tailings treated for 10,572 oz., an increase of 1902 oz. over the corresponding period of last year. The dividends for the month totaled £26,400, against £23,086 for the same month in 1902. The calls were £14,068, as against £6,985 for a similar period last year.

GENERAL MINING NEWS.

ALASKA.

JUNEAU DISTRICT.

Alaska-Treadwell Gold Mining Company.—The March return is 30,954 tons of ore crushed, estimated realizable value of bullion, $49,890; saved 800 tons of sulphurets, estimated realizable value of same $47,368. Working expenses, $60,581.

ARIZONA.

COCHISE COUNTY.

Copper Queen.—The territorial Supreme Court recently reversed the decision of the district court in the tax suit of Cochise County vs. the Copper Queen. Last year the board of equalization raised the Copper Queen Company on its mining property to about $4,500,000. The district court ruled against the county, stating that the raise was illegal because the valuation was out of proportion to mining property in other counties, and consequently the county would pay a disproportionate amount of territorial taxes. In effect, the ruling of the Supreme Court sustains the board of equalization.

(From Our Special Correspondent.)

Tombstone Consolidated Mining Company.—The mine water has been lowered 175 ft. below the 600-ft. level, and is steadily receding under the sinking pumps. The completion of the railway from Fairbank, on the San Pedro, to Tombstone was the occasion of great rejoicing and a formal celebration on April 12. The Tombstone Company will now build a spur to the mines, especially to the mouth of the new shaft.

GILA COUNTY.

(From Our Special Correspondent.)

Arizona & Hancock Company.—A good strike of copper ore is reported by A. C. Sieboth, superintendent of this company's mines on Mineral Creek. Sinking has been resumed, and the shaft will go down 200 ft. more.

J. O. Hill.—This mine, at Payson, is reported bonded to C. C. Clark and D. M. McFarland for $16,000.

MARICOPA COUNTY.

Black Diamond Copper Company.—This company's 100-ton smelter is reported running smoothly. The ore is transported from the mine to the smelter 1½ miles by an aerial tramway, which has a capacity of 600 tons daily, there being a difference of 800 ft. in elevation between the mine and the smelter. The company has 30 claims in a group, developed by tunnels, connected by winzes, so that the ore for shipment is loaded into tram cars at the mouth of the lowest tunnel.

YAVAPAI COUNTY.

Crowned King.—It is reported that the tailings at this mine, about 50,000 tons, will be roasted and treated by magnetic separators to remove the iron and with it the greater part of the gold. The zinc is then to be separated by concentration, and the tailings will be cyanided.

Octave.—This mine south of Rich Hill and the famous placers of Weaver, opens the large quartz vein formerly owned and worked by Johnson and supposed to be the extension of the vein which supplied the rich placer on the top of Rich Hill. There are two inclined shafts following the vein to a depth of 1,300 ft., and one or more tunnels. The output of quartz is about 130 tons a day, which is stamped and amalgamated and concentrated. The sands are cyanided.

ARKANSAS.

PULASKI COUNTY.

Labor Fuel Company.—This company, recently reorganized with a capital of $75,000,000, is to be a coal mining company, owned and controlled by union labor. G. Mallett, Southwestern representative of the American Federation of Labor, is president, and A. L. Raeter, chairman of the Railway Clerks' legislative board, is vice-president. The directors are all labor men. The company, it is said, has purchased 15,000 acres of coal land, and stock is being sold to labor unions on installments.

CALIFORNIA.

ALAMEDA COUNTY.

Pyne Smelting Company.—W. W. Anthony, of this company, of Alameda, is buying ore at the Julian Mines, San Diego County.

AMADOR COUNTY.

Alma.—This mine at Jackson, which has been idle some time may be worked again. It is reported that the holders of the bond are ready to make a final payment. However, the miner's strike will doubtless affect this transaction.

Kennedy.—The last 20 stamps of the new mill at Jackson are in place. The machinery for the new hoist is in position, except the boilers. J. T. Parks is superintendent.

Zeila Mining Company.—The sulphide works, at Jackson, W. F. Detert superintendent, are ready to start, but the miners' strike may cause the company to ship to the Tacoma, Wash., smelter, from which it has received good offers.

CALAVERAS COUNTY.

Big Six Mining Company.—This company has been organized at Stockton to work a mine near Valley Spring. The directors are T. P. Williams, D. L. McAfee and John Marshall, of Valley Spring; G. H. Raab, of Stockton, and R. M. Murray, of Oakland.

Great Western Mining Company.—At Rich Gulch 7 men are busy under Thomas Kavanaugh, superintendent. The force will soon be increased.

EL DORADO COUNTY.

Havilah.—It is understood that a cash payment has been made to the heirs of the Joshua Hendy Estate, 38 Fremont Street, San Francisco, for this mine at Nashville. The shaft is down about 800 ft., and there is a 20-stamp mill. The property has been idle for years. Lumber and material are being hauled to the mine. Mr. Allen is superintendent.

INYO COUNTY.

Lone Pine District.—Fifty or more locations on quartz veins have been made west of Lone Pine, but little development has been done. The main ledges are low grade, but the smaller ledges carry more values.

Reward Mining Company.—Ten stamps of the new mill at Reward, H. C. Steele superintendent, are at work and the others will soon be. The plant (20 stamps) is run by electricity.

Union.—A concentrating plant is being put up at Cerro Gordo by T. C. Boland to work the slag and tailings dumps of this old mine. The pumping plant and pipe line are being put in order.

KERN COUNTY.

Johannesburg Mining Company.—Eight men are at work on the quartz and placer claims. Eric Morrison is superintendent.

Pinmore.—This mine, near Johannesburg, has been leased by W. F. Ernst. The lease includes the mill. The mine has been idle for some time.

Rademacher District.—Some large mines are being opened in this district. A group of 16 claims has been secured by an Eastern company, which is to equip them with machinery. The company expects to ship to the proposed smelter at Bakersfield, but the ore will have to yield at least $18 per ton to be profitable.

Santa Ana.—Thirteen tons of ore milled from this mine at Randsburg yielded $60 per ton at the mill.

War Eagle.—This mine, adjoining the Yellow Aster at Randsburg, Mr. Castro superintendent, has a very large body of low-grade ore at the bottom of the deep shaft.

MARIPOSA COUNTY.

Dusenbery.—This claim at Whitlock has been bonded by H. C. Austin and others, who have a gasoline engine and pump at work.

Hotaling Ranch.—At this ranch, 20 miles east of Merced, in the foothills bordering Indian Gulch, several large nuggets have been found since the recent rains. One nugget was worth $129.

Pine Tree.—The old tunnel, beginning at the Benton mill site, and running 2,000 ft. to the Pine Tree and Josephine mines, Bear Valley, is being retimbered, and will be continued to the vein. The orebody is large, but low grade.

MONO COUNTY.

Standard Consolidated Mining Company.—The cyanide plant at Bodie, R. C. Turner superintendent, is being overhauled for spring work.

NEVADA COUNTY.

Goering & Sanders.—Negotiations are in progress for a sale of this quartz claim, 4 miles from Nevada City. If the sale is made a modern mill and hoist will be put up.

Gold Crown.—A half interest in this claim, near Nevada City, has been sold by George W. Tilton to Mrs. Belle Quarles.

Lecompton.—At this mine, near Nevada City, a 2-ft. ledge of high-grade ore is cut. The company has hoisting works, pumping plant and a 5-stamp mill, but will add more stamps and a larger pumping plant. There are 27 men employed.

Maryland-Idaho.—It is said this mine at Grass Valley, when unwatered and reopened as contemplated, will be equipped with a 100-stamp mill.

National Hill.—This mine, at Graniteville, J. H. English superintendent, has been closed for some months on account of the snow. A 3-drill compressor is being hauled in, and the mine will be reopened. The company has a 2-drill compressor already. There is a 10-stamp mill at the mine. The mine is drained by a 1,200-ft. tunnel, and the shaft is 300 ft. deep.

Orleans.—A 5-ft. vein has been found in this mine at Grass Valley, C. A. Brockington superintendent. Work has been underway for three years. Mr. Brockington does not think this is the old Houston Hill ledge.

Polar Star.—Work has begun on the buildings for this company at Grass Valley, James McCaffrey superintendent. The machinery will soon be hauled to the mill.

Union Blue Gravel.—At the mill on this mine at North Bloomfield, A. D. Gassaway superintendent, 10 more stamps will be put in this spring. There are now 10 stamps working high-grade gravel. Over 50 men are busy. The gravel is hauled to the mill by a small locomotive and cars. Work now is on what is known as the De Noon ground, a part of the old Derbec channel.

PLACER COUNTY.

Gaylord.—At this mine, Ed Gaylord superintendent, rich gravel is reported found and a new company has been formed to equip the mine, near Newcastle.

SAN BERNARDINO COUNTY.

There is now a proposition to pipe water into Dale from a distance of about 20 miles.

SAN DIEGO COUNTY.

Washington.—An 18-in. vein of free gold ore is reported in this mine at Julian.

SANTA CLARA COUNTY.

Chapman.—This quicksilver mine, near San Jose, which has been idle since 1878, has been sold to Boston men.

SHASTA COUNTY.

Afterthought.—At this mine, W. G. Scott superintendent, 15 men are at work. Machinery for the new smelter is arriving.

SISKIYOU COUNTY.

Cherry Hill.—This quartz mine, at Yreka, will be closed several weeks, owing to a break in the compressor. The main lower tunnel is now in 1,767 ft.

Commodore.—This mine, on Barkhouse Creek, recently purchased by a company, of which W. S. Weymouth is superintendent, will have the mill put in order.

Double Eagle.—This mine, on Barkhouse Creek, owned by Quigley & Barton, had about 900 ft. of drifting and tunneling done during the past winter.

Punch Creek.—This mine, at Humbug, owned by George W. Grayson, of San Francisco, shows a 6-ft. ledge.

SIERRA COUNTY.

Molter.—At this quartz mine, at Poker Flat, machinery is on the ground ready for a mill as soon as the season permits. J. B. Lassiat is in charge.

Plumbago.—At this mine, owned by the Croesus Mining Company, near Alleghany, Mason W. Mather, of Moore's Flat, superintendent, the pay shoot has been cut in the lower tunnel. As soon as the weather permits the 20-stamp mill will start.

White Bear.—At this mine, near Monte Cristo, 20 men are busy on development. This is a drift mine, and will soon be well equipped.

SONOMA COUNTY.

Gray Copper.—This mine, 6 miles from Cazadero, owned by Isaac Gray, consists of three claims. A 300-ft. tunnel has been run, but little else in the way of development has been done.

STANISLAUS COUNTY.

Summit, Adobe Valley and Orestimba.—These quicksilver claims are being developed by Alvinza Hayward, under Superintendent E. P. Newhall. On the Summit a 420-ft. shaft has been sunk and a 1,000-ft. tunnel run. Preparations are being made to drive cross-cuts. A contract has been let to make 500,000 brick for the new furnaces, to be built by Robert Scott, of San Jose. The nearest town is Livermore, in Alameda County.

TRINITY COUNTY.

Surface mining is very active along Canyon Creek, near Junction City. One of the largest claims is owned by the Dannenbrink Brothers, who have about 25 ft. of gravel bank and are hydraulicking with a pressure of 250 ft.

Sweepstakes.—The principal promoters in making the sale some years ago, John F. Davis and Frank H. Hall, intend to work the mine themselves. It is said the richest ground was not properly tested by the company which purchased and abandoned the mine.

Wonder.—W. S. Hotchkiss has struck rich gravel in this mine on Trinity River, near Bragdon. He thinks he has struck the main pay channel for which he has long been seeking.

TULARE COUNTY.

Minnie Ellen.—This mine, near Porterville, owned by Frank Cook and C. F. Fox, has had a satisfactory crushing.

Rocky Hill.—Charles Nieman and John Showers are opening this quartz mine, near Porterville, and a 90-ft. shaft has been sunk.

TUOLUMNE COUNTY.

A number of citizens at Carters, are organizing a local mining company to develop prospects.

Olsen.—Operations have been discontinued at this mine, near Cooperstown.

Ryan-Mackey.—At this copper mine, near Stent, David Atkins superintendent, a boiler and engine have been put at the shaft and a pump will be added. As soon as the shaft is unwatered a large hoist will be erected. It is possible a new shaft will be sunk.

Star King.—At this mine, near Carters, operations have been resumed under the management of C. A. Holland, notwithstanding the litigation pending.

Violet.—This claim, at Groveland, has been bonded by James Chapman for a year.

COLORADO.

BOULDER COUNTY.

Ward Rose.—Manager A. R. Donaldson, of this mine, at Puzzler, reports that a drift will be run at the 260-ft. level to open an ore-body known to exist. High-grade ore is taken from a 4-in. streak, and some low-grade ore is being stored for shipment to the Wall Street Mill.

EL PASO COUNTY.

United States Reduction and Refining Company.—Ground has been broken for the new $50,000 chlorine gas plant to be erected at Colorado City. The plant will manufacture chlorine by electricity, instead of by the present method of mixing acids. The new process was invented by J. Dawson Hawkins and H. W. Fox, superintendent and assistant superintendent of the Standard Mill. The building will cover a space of approximately 200 by 200 ft., and will be ready for operation within 4 months.

FREEMONT COUNTY.

Bassick.—The mill at Querida is turning out concentrates, the tailings from which are cyanided in the new plant.

Keystone Oil Company.—This company has struck oil in its No. 3 well at a depth of 2,400 ft. Pumps will be installed at once. No gas has been encountered.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Clark-Gardner Mining Company.—This company, operating the Clark-Gardner Mine on Quartz Hill, has received a new 80-h.p. boiler.

Gregory-Buell Consolidated Gold Mining and Milling Company.—A contract has been given to McFarlane & Co., of Central City and Black Hawk, for the erection of a slow drop 45-stamp mill, with automatic feed, to be completed in three months. The property is situated midway between Central City and Black Hawk. The management will let contracts for 1,000 ft. of machine driving, a new air compressor being installed this month. The Gregory property is producing both smelting and milling ore.

Kansas-Burroughs Consolidated Mining Company.—The shipments during March were 170 cars, or 1,450 tons, the greater part being milling ores. The ores were taken out almost entirely under tribute or sub-lease.

Little Clara.—An important strike has been made at this property in the Yankee District about 9 miles west of Central City, at a depth of 70 ft. The vein is 6 ft. wide, with two well-defined mineral streaks carrying ore which assays from 25 to 52 oz. gold, and from 18 to 62 oz. silver to the ton. The property is owned by Hawk Brothers, of Yankee.

New Milling Plant.—Nebraskans are interested in the Edna and Mida mining companies, and will erect a 20-ton plant at the junction of Russell and Lake Gulches by June 1. The machinery has already been contracted for with Fairbanks, Morse & Co., of Denver. E. C. Miles, of Black Hawk, Colo., is manager.

Old Town.—The Old Town Consolidated Mining Company has received a car-load of ore for the Old Town Mine in Russell District, consisting of 80-h.p. steel boiler and other machinery.

Rhoderick Dhu Gold Mines Company.—This company has been formed with a capital stock of $1,500,000 to work the Rhoderick Dhu and Protection mines on Quartz Hill, which are credited with a past production of nearly $2,000,000. The incorporators are L. G. Haunsein, S. L. Morris, J. C. Fleschutz, E. G. Kanaer and L. F. Butler. A plant capable of hoisting from 1,000 ft. will be installed, and new buildings erected. The work is to be in charge of John C. Fleschutz.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

Leadville Ore Output.—The past week has seen another increase in the iron production and also the starting up of territory idle for years, but containing iron and lead sulphides that can now be mined at a profit. The daily production the past week averaged 2,800 tons all classes of ores.

Alleghany Mining Company.—Thomas Raney will start this proposition after a long idleness through the Shenango shaft. He will begin shipments of 75 tons daily at once from the sulphide deposits at the 600-ft. level.

American Smelting and Refining Company.—The Arkansas Valley plant has 8 furnaces handling about 900 tons per day all told. The sulphide mill is handling 250 to 300 tons of low-grade sulphides daily.

Boulder Mining Company.—The water is now stationary almost to the top of the White Cloud shaft. Manager Timothy Kyle is arranging to install a large pump and resume sinking.

Caribou.—Iron shipments have increased from 50 to 150 tons a day, and some good bunches of lead ore run up the profits.

Cloud City Mining Company.—Drifts are being run under the large manganese body at the 500-ft. level. As soon as returns from the steel works are received the mine will ship 30 tons to Pueblo.

Coronado.—The water is lowered to the 600 ft., where a large pump is being installed.

Diamond Gold Mines Comapny.—The new strike has opened up an immense ore-body, the ore having been followed in 300 ft. and cross-cut for 300 ft. It is a shipping grade oxide, and 50 tons daily are being handled. As soon as the new hoist just purchased is in place shipments will be doubled. New York and Philadelphia parties are back of this gold belt proposition, and spent $250,000 before getting the ore.

Evalyn Mining Company.—Occasional shipments of sulphides are being made from the Evalyn shaft, and important prospecting work is being done at the 1,000-ft. level.

Iron Silver Mining Company.—The output is 300 tons a day through the Moyer workings.

La Plata Mining Company.—All work is done by lessees who are shipping about 50 tons of iron per day.

Little Louise.—Manager Linderman says a plant for the free milling ore will be erected this summer.

Mikado.—After lying idle since 1898 this property is resuming work under lease to A. Dyatt, who will operate at the 1,000 ft., where are large deposits of iron and zinc sulphides that could not be treated profitably five years ago. Shipments will begin at 75 tons daily.

Mosquito Range.—This virgin section is in the eastern end of the gold belt, and ore shoots have been traced through to Park County. Drill holes last year showed some very high gold values. Much of the ground has been patented and new work will start this summer.

New Leadville Home Mining Company.—Shipments have increased to 225 tons a day, the iron being of much better grade than usual. Immense reserves have been opened in new territory.

Ohio & Colorado Smelting and Refining Company.—Four lead furnaces and a matte furnace are in blast, while work has begun on 12 reverberatory roasters to cover an area of 145 by 650 ft., and to be connected with the new sulphide mill.

Republic Smelting and Refining Company.—This is the old Boston Gold-Copper Company pyritic plant. It will be allied with the Ohio & Colorado Company at Salida. Three furnaces are to be installed here, capable of handling 500 tons of low-grade ore daily. Manager Goodwin states the plant will blow in about July 1.

Resurrection Gold Mining Company.—Shipments have increased to 150 tons daily. The new mill is successfully handling a tonnage of 150 tons daily by magnetic concentration.

Yak Mining, Milling and Tunnel Company.—The company is running laterals to open territory on which it has a lease, and is shipping about 150 tons

a day. There is some talk of extending the tunnel into the Diamond ground.

SAN JUAN COUNTY.

Anglo-Saxon.—The lower tunnel, near Silverton, is being pushed to cut the ore shoot recently opened in the upper workings.

Tom Moore.—Machine drilling continues regularly, and the tunnel near Silverton is in 2,000 ft.

Yukon Tunnel.—Work is being pushed, and the tunnel, near Silverton, is in 1,500 ft. It is expected to cut the main vein within a few weeks.

SAN MIGUEL COUNTY.

Tomboy Gold Mines Company.—The return for March is: 7,100 tons of ore crushed, yielding bullion to the estimated value of $64,500. Concentrates shipped, 570 tons, estimated to realize $14,000. Ordinary expenses for the month, $40,500. Profit, $38,000. Expenditure on capital account not included in expenses, $28,200. The capital expenditure consists of the amount paid to complete purchase of the Fraction Claim lying between the Argentine No. 2 and the Red Cloud properties held under option.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

Cripple Creek Drainage Tunnel.—A temporary injunction has been issued restraining this tunnel from crossing the Grace Arthur Extension lode claim. The suit was brought by the Cripple Creek Tunnel, Transportation and Mining Company, which owns the Standard Tunnel and the Grace Arthur Extension claim. It has a contract with El Paso Company, by which the latter company agrees to pay the Standard certain sums for drainage. Should the new tunnel be completed it will render the Standard Tunnel valueless, hence the injunction. The injunction has no present effect on the work, since the tunnel has not reached the claim in controversy.

Cripple Creek Tunnel, Transportation and Mining Company.—This company, owning the Standard Tunnel, which penetrates Beacon Hill, has brought suit against the El Paso Company for the sum of $85,000, which it alleges is due for drainage.

Portland Gold Mining Company.—This company is putting in an automatic conveyor for carrying the waste from the ore house to the dump at No. 2 shaft. The company is working a little over 500 men. One of the dumps of one of the old shafts is being shipped bodily to the mill at Colorado City. The dividend of $90,000 has been paid.

Theresa.—Work has recently started again under lease, and 10 men are employed by L. E. Hill and associates, who are also interested in the Golden Cycle. The company owning the claim is controlled by J. T. Milliken, who is president of the Golden Cycle.

West Side of Beacon Hill.—This is just now one of the liveliest sections of the Cripple Creek District. The El Paso is pursuing the even tenor of its way, and shipping considerable ore. A new Heine boiler plant of about 500 h.p. is being put in. From the C. K. & N. Company's ground, worked under a long lease by Horace Granfield, some very good ore is being shipped. The property is equipped with a good hoist and compressor, and is usually classed as one of the very best leases ever given in the district. Further down the hill, looking for the extension of the rich ore shoot, is the Old Gold shaft worked under lease by Granfield & Taylor. Sinking is going on, and it is understood that some ore has been found. A little further to the west is the Henry Adney, worked under lease and bond by Mike Burk and associates, who are also sinking after the extension of the C. K. & N. ore shoot, and apparently stand a good show of getting it. Up toward the foot of Guyot Hill is the little Bessie property, well equipped with a fine hoist and a compressor. At present drifting for the El Paso veins is in progress. Not far from this are the Crowder workings of the Maid of Orleans claim, in which a little work is done at times.

Work Mining and Milling Company.—At the annual meeting of the stockholders the following directors were elected: I. W. Bonbright, J. A. Connel, G. R. Buckman, M. F. Stark and E. H. Every. The report of the officers showed about $20,000 in the treasury. The directors announce that the policy of the company will not be changed, and leasing will be continued. I. W. Bonbright was chosen president, Mr. Connel vice-president and general manager, and J. F. Sanger secretary.

IDAHO.

IDAHO COUNTY.

American Eagle.—This company has a 10-stamp mill steadily at work at Elk City. The mill is reported to have been crushing about 20 tons a day. A waterwheel, now on the way, is to replace the steam engine. A boiler and engine are being put in from the old Alamance property, for running the sawmill.

Crooked River Mining and Milling Company.—This company, at Elk City, has let contracts for more stamps to the Allis-Chalmers Company. The company is figuring on a machine shop, a foundry to cast its own shoes and dies, and other improvements.

Juno.—This group in Thunder Mountain District, owned by George Stonebreaker and associates, has been bonded by Duluth, Saginaw and Detroit men.

KOOTENAI COUNTY.

Panhandle Smelting and Refining Company.—It is stated that work will begin at once on the smelters with a crew of 50 men. The smelter will be on the Northern Pacific tracks, 1½ miles east of Sand Point. The Pend d'Oreille Development Company will finance the Panhandle Smelting and Refining Company, build the smelter and turn it over to the smelting company. W. A. Murphy, of Saint Paul, is vice-president of the company, and A. Kline, of Saint Paul, president. Manager H. H. Williams, accompanied by Paul Johnson, have been in Sand Point arranging preliminaries for starting work.

SHOSHONE COUNTY.

Bullion.—The new boiler, pumps and hoist at this copper claim, near Wallace, are in operation. As soon as the water is pumped from the 67-ft. shaft sinking will start.

Bunker Hill & Sullivan.—J. L. Safford has secured a lease from this company on the large waste dumps of the mine. A force of men will be put on at once. Mr. Safford's method of working is by running flume lines to control a large supply of water, and then sluicing the ore from the waste by means of riffled sluices and screens.

French Creek Placers.—This company put in a bedrock flume last fall, and is already moving gravel.

Hecla.—This mine is reported shipping 1,200 tons a month, and working 110 men.

Standard.—This property, controlled by the Finch & Campbell interests, is reported working about 275 men, and shipping 2,800 tons of ore a month. It is keeping up monthly dividends of $25,000.

Wild Rose.—The 3-stamp mill, at Pierce, has started. The company is figuring on a larger mill this summer.

WASHINGTON COUNTY.

Peacock.—The State Supreme Court recently decided the Seven Devils mining case brought by Granville Stuart against ex-Governor S. T. Hauser, of Montana, and others. The decision is in favor of the defendants, the judgment of the lower court being affirmed. The case involved interests in the Peacock, White Monument and Helena copper mines in the Seven Devils District. Transactions involved run back to 1889.

INDIANA.

LAPORTE COUNTY.

(*From Our Special Correspondent.*)

Oil Land Sale.—Oil properties, said to be worth between $6,000,000 and $7,000,000 in the Trenton rock fields, are to be transferred to a French syndicate under a deal that is being closed in Laporte. The properties include land, wells, pipe lines, tanks, cars, refineries, etc. The syndicate will operate with the United States Petroleum Company and the National Consolidated Oil Company, and will control most of the crude oil produced in Indiana and Ohio. C. E. Russell, of Laporte, negotiated the deal.

PERRY COUNTY.

(*From Our Special Correspondent.*)

American Cannel Coal Company.—This company, of Cannelton, which has had its mines shut down for 2 years on account of labor troubles has opened to full capacity, an agreement with the miners being affected.

SULLIVAN COUNTY.

(*From Our Special Correspondent.*)

A New York syndicate has purchased 8,000 acres of coal land in this county for $300,000. The deal was negotiated by John S. Bays, who has several times secured options on Indiana mines for the purpose of organizing a big corporation.

Miners' Strike at Lyford.—Because of a dispute as to the terms of the agreement for employing shooters the miners have struck, and work is suspended in the Lyford mines. Prof. Thornton, of Cornell College, who was selected to arbitrate for the miners, cannot serve, and until a successor is selected the dispute will remain unsettled.

INDIAN TERRITORY.

The Interior Department has segregated 440,000 acres of coal and asphalt lands in the Choctaw and Chickasaw nations, and the land will be sold in a short time under section 58 of the agreement between the United States and the Choctaw and Chickasaw Indians. All coal and asphalt deposits in the corporate limits of any town site in the territory are to be sold at public auction, and a similar provision applies to the coal or asphalt lands not held under the lease. A commission of three members will conduct the sale of the Indian Territory coal and asphalt land, and the sales must be made three years after the ratification of the agreement.

CHOCTAW NATION.

Coalgate Mining Company.—This Coalgate Company has struck 5 ft. of coal at a depth of 630 ft., and has let the contract for a steel tipple.

LOUISIANA.

CALCASIEU PARISH.

(*From Our Special Correspondent.*)

Jennings Oil Field.—The Home Oil Company's well within the city limits is a dry hole at 1,800 ft. It may be drilled 1,200 ft. deeper. The company recently purchased one acre of proven oil land for $12,000.

A well sunk by Mayo & Brady, near the Union Sulphur Company property at Fort Charles, is said to be yielding a good flow of oil at 515 ft.

ST. MARTIN'S PARISH.

(*From Our Special Correspondent.*)

Anse Le Butte.—Heywood Oil Company No. 1 well will be a gusher if a proper screen can be put down to exclude the fine sand. The No. 2 is also a producer. Several wells are nearing completion.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(*From Our Special Correspondent.*)

Copper Shipments.—Navigation has opened at copper country ports, though lake vessels are not yet running regularly. The wharves of the smelters are practically bare of copper, the unprecedented rail shipments having cleaned up stocks. A careful canvass shows only about 3,000 tons of copper, mostly ingot, the demand for which is light at present.

Arcadian.—Over 100 men are employed, and the output averages about 25 tons of copper monthly.

Calumet & Hecla.—This company has stored 18,000 tons of mineral, averaging nearly 90 per cent copper, at Lake Linden for summer shipment to its smelters at Black Rock, Buffalo. The work of installing skips to replace the 2-deck cages in the Red Jacket shaft will begin this week. It is expected that the new method of hoisting will greatly increase the capacity. Two compartments are now devoted to hoisting rock, 2 to water and 2 to men and supplies. The rock shipments do not average over 500 tons per day.

Lake Superior Concentrating Company.—This company is remodelling its plant on the old Franklin stamp sands at Ripley. A 250-h.p. engine and an additional boiler are being installed. Several new jigs will be put in, and the plant will be ready for extracting copper from the old tailings by May 1.

Osceola Consolidated.—Seventy-five trammers at the North Kearsarge branch are out on a strike, demanding a raise in wages from $52 to $58 per month. The management offered $56, which was refused. New men will be secured to replace the strikers. No trouble is anticipated. Production is at a standstill.

St. Mary's Mineral Land Company.—This company will resume explorations with the diamond drill on its property immediately south of the Globe tract, owned by John Stanton, of New York.

Trimountain.—John Knox, assistant superintendent, has resigned to accept the superintendency of the Eva Mine of the Calumet & British Columbia Gold Mines Company, at Fish River, Lardeau Division, B. C. No. 5 shaft, started last fall, will be sunk this summer. Considerable difficulty will be encountered owing to the overburden being 250 ft. thick.

COPPER—KEWEENAW COUNTY.

(*From Our Special Correspondent.*)

Miskwabik Development Association.—Work will be delayed 2 weeks, owing to the deep snow. A trench will be run across the property in hopes of striking the Kearsarge lode.

Mohawk.—The mill at Gay, on Traverse Bay, is treating 910 tons of rock per day. The rock averaged 25½ lbs. of copper to the ton stamped in March. Shipments from the stock piles at the mine have started.

COPPER—ONTONAGON COUNTY.

(*From Our Special Correspondent.*)

Mass Consolidated.—A contract for a new engine and boiler house at C shaft has been awarded to J. J. Beatty, of Mass City. Work on the foundation has started. A 1, 200-ft. hoisting engine, for temporary use, and two 160-h.p. boilers will be installed. The Mineral Range Railroad Company will build a spur to the new shaft. Grading will start at once.

MISSOURI.

JASPER COUNTY.

(*From Our Special Correspondent.*)

Bumper.—This company, recently incorporated to operate a lease of the Brooks land in the West Hollow section of Zincite, has a prospect shaft now sinking in ore. O. M. Odell and other Missouri Pacific Railway officials are the stockholders.

Cemetery Lease.—The city of Joplin has 18 acres of swampy land adjoining the city's cemetery. Re-

cent drill prospecting on the Empire Zinc Company's smelter reserve on the west indicated a run of ore toward this plot. Budd M. Robinson and associates have a lease from the city, paying a bonus of $2,500 and a royalty of 20 per cent on all ore mined. Two drill holes have already struck ore.

Frye & Co.—This concern has found lead in the first drill hole on a lease acquired from the Picher Lead Company northwest of the company's lead works in Joplin. The ore was struck at 94 ft., and the drill is still in ore at 109 ft.

Maybelle Mining Company.—This company, composed entirely of Joplin people holding a lease on 10 mining lots on the land of the West Joplin Lead and Zinc Company, is sinking on a drill discovery of 19 ft. of zinc ore at 142 ft.

McAbee & Boyd.—This company has found ore in a drill hole on 80 ft. on a lease of 20 acres at Duenweg, adjoining the Gussie K property.

LAWRENCE COUNTY.

(*From Our Special Correspondent.*)

Bonanza.—In drilling at this old mine ore was found 1 ft. below the bottom of the shaft, and 7 ft. were cut the first day. It is on the land of the Cleveland & Aurora Mineral Land Company at Aurora.

Bowyer.—This mine, at Aurora, on the edge of what is known locally as a sand ridge, for years supposed to be barren of ore, is being sunk to the 320-ft. level. It is now to the 225-ft. level, and still in ore.

Hays City.—This mine has found an extension of its vein by shooting through a rib.

Scott & Coleman.—This company, at Aurora, is developing a body of ore by sinking a winze shaft from a drift on the 170-ft. level.

MONTANA.

BROADWATER COUNTY.

(*From Our Special Correspondent.*)

East Pacific.—R. A. Bell, who has worked this property for eight years, has placed this mine and several other quartz properties in a corporation, organized under Arizona law, with a capital stock of $1,500,000, and the following officers: R. A. Bell, Helena, president; W. W. McDowell, of Butte, vice-president; A. L. Smith, treasurer, and W. H. Dickenson, of Helena, secretary. The company intends to build a concentrator with a capacity of 75 tons at the East Pacific Mine during the summer. This mine has produced upwards of $1,500,000 through the smelters, and there is an accumulation of $200,000 worth of second-class ore on the dumps, to be concentrated.

DEER LODGE COUNTY.

(*From Our Special Correspondent.*)

Allen Gold Mining Company.—This company, capitalized at $500,000, represents a consolidation of the various placers and quartz interests of W. R. Allen in French Gulch. Mr. Allen three years ago put a Postlethwaite dredge on the lower end of the gulch, which has had two seasons of successful work. Further up the gulch an Evans hydraulic elevator is in operation. At the head of the gulch Mr. Allen has three bedrock flumes with a breast width to the gravel bank of 800 ft. The average depth to bedrock is 20 ft. The gold is coarse, ranging up to nuggets of several dollars each. French Gulch was one of the noted gold gulches of the 60's, and produced $5,000,000 from 1865 to 1870. The gulch heads in a basin on a spur from the main continental divide. Besides the placer Mr. Allen has under development a number of quartz claims, some of which have produced fair shipping ore. The directors for the first three months are W. R. Allen and T. C. Davidson, of Anaconda; W. W. McDowell, of Butte; P. Y. Foley, of Chicago, and Fulton R. Gordon, of Washington, D. C.

FERGUS COUNTY.

New Sapphire Mines Syndicate.—The output of this English company from its Yogo mines for the past year has been 200,000 carats, an increase of more than one-half over any other year, according to Geo. Stenfel, of London, Eng., one of the members of the syndicate, who recently visited Yogo, and arranged for working the mines to their full capacity. He expects the output will be 300,000 carats.

FLATHEAD COUNTY.

(*From Our Special Correspondent.*)

Iowa Group.—This property is 25 miles south of Troy, on the range between the Kootnai and the Clark's Fork rivers, at the head of Lightning Creek. The tunnel on the Iowa Claim is in 165 ft, showing concentrating ore (chalcopyrite) 12 ft. wide. J. O. D. Ross and F. R. Lowry, of Libby, are the owners. Tests show a value of about $75 per ton of concentrates in silver and copper.

GALLATIN COUNTY.

Montana Corundum Company.—Work at this company's property, near Salesville, has been stopped, owing to differences between the directors and the management. The machinery is reported to have worked all right, and the mine is turning out quite as well as expected. It is understood that there has been friction from the start between the directors.

(*From Our Special Correspondent.*)

Montana Onyx Mining Company.—This company proposes to develop a deposit of onyx about 5 miles north of the town of Manhattan. The officers are: O. P. Chisholm, president; Charles Chisholm, vice-president, and R. B. Chisholm, secretary and treasurer. The headquarters are at Bozeman.

MADISON COUNTY.

Bismarck & Nugget Gold Mining Company.—Walter M. Brown, directing engineer for this company, near Sheridan, reports that if the plans of the company are carried out it will spend over $100,000 in building a mill, and developing the mines at Brandon. The gallows frame for the new hoist has been erected.

Washoe Smelter.—Nearly 300 men are employed on the construction of the large stack to carry away the sulphur and arsenic fumes, which have been a nuisance to the ranchers in the Deer Lodge Valley. The new stock is to be 300 ft. high, and will be at the highest point of ground above the Washoe plant. A full gang of bricklayers is at work. The stacks at the lower works are being blown down by dynamite, the brick cleaned of all mortar and used in constructing the new stack.

SILVER BOW COUNTY.

(*From Our Special Correspondent.*)

Nipper.—Judge Clancy has granted Arthur P. Heinze an additional two weeks' time, or until May 1, to pay into court the $22,000 allowed Receiver Thomas McLaughlin and his attorneys for their services in connection with the case.

Yellow Boy.—Charles Geyman is making regular shipments of concentrates to the East Helena smelter from this property, near the old Parrot Smelter. East Helena is making a better rate than can be had in Butte.

NEW MEXICO.

GRANT COUNTY.

Pinos Altos Gold Mining Company.—C. E. Derbyshire is operating this company's property at Pinos Altos, under lease, and is also subleasing.

OREGON.

GRANT COUNTY.

Big Creek Mining Company.—This company is now carrying on extensive operations without the use of hydraulic pressure. Shafts are sunk to the ancient river gravel and drifts run. A hoist is to be installed, using both cage and ore cars. A pump to handle 200 gals. of water a minute will also be placed at the mouth of the shaft. The ancient river channel is said to be 100 ft. wide. The gold is rusty, but coarse.

Dart.—G. W. Dart has leased the pipe, giants and all the mining material belonging to the Humboldt Mining Company, and has men laying pipe and getting everything in readiness for the summer's run. The mine is situated on the west side of Canyon Creek, between John Day and Canyon City, and nearly opposite Long Gulch. Water will be used from the Humboldt ditch.

Standard Consolidated Mines Company.—This company is to control the properties of the Standard Gold and Copper Mining Company, the Copper Ridge Gold and Copper Mining Company, the Willie Boy group and some individual claims, in Quartzburg District. Headquarters will be at Pendleton and Sumpter. The officers are: President, T. C. Taylor, Pendleton; vice-president, Zoeth Houser, Echo; secretary and general manager, Edward W. Mueller, Sumpter; treasurer, C. B. Wade, Pendleton; auditor, E. E. Cleaver, Prairie City; other directors, Frank Richet, of Portland; F. L. Forbes, of Pendleton; S. P. Purdy, of Athena. The company may erect a stamp and concentrating mill as soon as possible.

UNION COUNTY.

Pomeroy Dredge.—This dredge on John Day River is ready to start work. It was put in last year at a cost of over $100,000, and made a short run.

PENNSYLVANIA.

ANTHRACITE COAL.

Anthracite Miners' Strikes.—The executive boards of the three anthracite districts of the United Mine Workers of America, in convention at Wilkes-Barre, has issued instructions that all mine workers on strike or locked out should return to work, pending an adjustment of all differences by the Board of Conciliation provided for by the Anthracite Coal Strike Commission. District Presidents T. D. Nicholls, of Scranton; W. H. Dettry, of Hazleton, and John Fahy, of Shamokin, have been selected as the miners' representatives on the Board of Conciliation.

BITUMINOUS COAL.

Sackett Coke Company.—This company is capitalized at $115,000, and composed of Fayette County men. The directors are William W. Parshall, of Uniontown; Hugh R. Sackett, Ross F. Hodges and Adolph A. Eberhart, of Smithfield, and William J. Lyons, of Gans. The company has 160 acres of coal lands and about 225 acres of surface in Springhill Township.

SOUTH DAKOTA.

CUSTER COUNTY.

(*From Our Special Correspondent.*)

Tin Prospects.—Several Eastern promoters have had representatives in this section of late, investigating tin deposits.

Black Hill Porcelain Clay and Marble Company.—The company has another car-load of mica loaded, ready for shipment east.

Grand Junction.—There is a deal pending on this property, near Custer.

LAWRENCE COUNTY.

(*From Our Special Correspondent.*)

Buxton & Big Bonanza.—John Lundberg, J. V. N. Dorr and A. D. Wilson have purchased this group of 7 claims from H. W. Seaman, of Clinton, Ia. The purchasers propose to build a cyanide plant. Messrs. Lundberg and Dorr have a lease on the Rossiter cyanide plant at Deadwood, and have been treating the ore of the group there for the last year. Mr. Lundberg has been the lessee of the group nearly 10 years.

Dakota Mining Company.—The cyanide plant at Deadwood will be enlarged to nearly double its present capacity as soon as the bonds issued can be sold. The mines and mill are both at a standstill.

Lexington Hill Gold Mining Company.—Funds have been raised in Boston, Mass., to build a large cyanide plant at the mines in Spruce Gulch. An electric power plant will be built in Deadwood, 2 miles from the mine. The company has practically absorbed the assets of the Black Hills & Denver Company, owning a large acreage and a 50-ton stamp and cyanide plant.

Horseshoe Mining Company.—Mining is in progress on the Ben Hur and Lucile claims. Ore from the former is shipped to a local cyanide plant, and from the latter to a Denver smelter. Building has been resumed on the new 500-ton cyanide plant at the Mogul Mine. At the meeting of stockholders, at Beulah, Wyo., the proposition to prefer the treasury stock to the amount of 12 per cent per annum, was passed. Under the contract this stock will receive its par value in case of a dissolution and distribution of assets before the other stock receives anything. The stockholders also ratified the issue of $600,000 in 6 per cent bonds, for the purpose of carrying on improvements.

PENNINGTON COUNTY.

(*From Our Special Correspondent.*)

Burlington Mining Company.—Local men have organized this company to develop 6 claims near the head of Friday Gulch. The company is incorporated under South Dakota laws, with a capitalization of $1,500,000. J. B. Taylor, Hill City, is president; Joseph Hattenbach, Deadwood, vice-president; J. L. Bentley, Deadwood, secretary; D. A. McPherson, Deadwood, treasurer, while Norman T. Mason, H. S. Vincent and W. S. Elder, of Deadwood, and Christian Miller, of Hill City, are also directors.

Columbia Gold Mining and Milling Company.—The new plant at the Rochford shaft is in use. The shaft will be sunk to 200 ft., where cross-cutting will start.

UTAH.

(*From Our Special Correspondent.*)

Ore and Bullion Settlements.—For the week ending April 17 the Salt Lake banks report settlements on ores and bullion as follows: Bullion, $129,700; gold, silver, lead and copper ores, $254,100; gold bars, $24,700; making a total of $408,500.

Bingham Consolidated Smelter.—For the week ending April 17 the shipments reported were 179,000 lbs. copper bullion.

Highland Boy Smelter.—The shipments for the week ending April 17 were 247,460 lbs. of copper bullion, or 4 cars.

United States Smelter.—During the week ending April 17 this smelter sent east 184,055 lbs. of copper bullion.

BEAVER COUNTY.

(*From Our Special Correspondent.*)

Wild Bill.—This property is under option to J. W. Taylor, who represents Columbus, O., investors, that own the Hub property extending from the Majestic to the Wild Bill.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Tintic Shipments.—The shipments for the week ending April 17, as received and reported by the samplers are: Bullion-Beck, 4 cars; Carisa, 1 car; Gemini, 13 cars; Star Consolidated, 3 cars; Mammoth, 15 cars; Uncle Sam, 2 cars; Grand Central, 26 cars; Victor Consolidated, 6 cars; Yankee Consolidated, 5 cars.

Eagle & Blue Bell.—It is understood that a Boston syndicate has undertaken to purchase the McChrystal interest, which represents a control of the company. It is stated also that the parties forming the syndicate are allied with the Bingham Consolidated.

Grand Central.—A dividend of 10c. per share has been declared, payable April 22.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Shipments.—For the week ending April 17 the shipments were: Columbia, 2 cars; Dalton & Lark, 1 car; Jersey Blue, 1 car.

Bingham Consolidated.—Col. H. G. Heffron, long connected with this company, has resigned to devote his time to personal interests.

Davis Gebhart Group.—This Bingham property is reported under a $250,000 option to W. C. Ochs. The property comprises some 150 acres near the United States, Bingham, New Haven and Highland Boy mines.

SUMMIT COUNTY.

(*From Our Special Correspondent.*)

Park City Shipments.—For the week ending April 17 the receipts at the Mackintosh Sampler were: Daly-West, 3,455,230 lbs. of crude ore and concentrates.

Comstock.—This mill will soon be in steady operation as all the construction is practically completed.

TOOELE COUNTY.

(*From Our Special Correspondent.*)

Stockton Shipments.—For the week ending April 17 the Ophir Hill Company sent in 24 cars of concentrates.

Proposed Smelter.—Plans are on foot to erect a smelter at Stockton to treat the Honerine and other ores. It is said that the Ophir Hill mines are favorable to the project. For the necessary siliceous ore some mine in Tintic is needed, and it is surmised that the Mammoth Mine will join the plan.

WASHINGTON COUNTY.

(*From Our Special Correspondent.*)

Dixie Smelter.—Two cars of copper bullion, the first product of the new smelter, are on the way to market. It is expected the output will be continuous.

WASHINGTON.

FERRY COUNTY.

Republic Consolidated Gold Mining Company.—The Merchants' Bank of Canada has brought suit against this company to collect three promissory notes. One is for $15,000, and is dated August 8, 1900. The second is for $10,000, and dated February 25, 1901, and the third is for $15,000, and dated March 25, 1901. It is said the company has been endeavoring to induce the bank to take the company's bonds in lieu of the notes, but the bank, after considerable negotiation, it is said, declined, and instituted suit. The Republic Power and Cyaniding Company, which is a subsidiary corporation of the Republic Consolidated Gold Mining Company, went into the hands of a receiver some time ago.

STEVENS COUNTY.

Northport Smelter.—The ore receipts at the smelter for the first 13 days of April were 187 cars, or about 7,480 tons. Only three furnaces have been running. As fast as more coke arrives others will start. The yard is full of ore, and space for a new roast heap is being cleared.

FOREIGN MINING NEWS

AFRICA.

RHODESIA.

The Chamber of Mines at Buluwayo reports the gold output in February as follows, in crude ounces: Mill, 12,813; tailings cyanided, 3,908; other sources, 369; total, 17,090 oz., against 13,204 oz. in February, 1902. The total bullion in February, 1903, was equal to 14,038 oz. fine gold, or $291,150.

AUSTRALIA.

WESTERN AUSTRALIA.

The Mines Department reports the gold output in March at 194,723 oz. bullion. The total for the three months ending March 31 was 597,572 oz. bullion, against 498,357 oz. for the corresponding period in 1902; an increase of 99,215 oz., or 19.9 per cent. The total this year was equal to 506,505 oz. fine gold, or $10,469,460.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Ore shipments from the mines of the Boundary District during the week ending March 18 amounted to 6,833 tons, as follows: Granby Mines, 5,423 tons; Mother Lode, 1,410. Total for year to date, 142,297 tons. A large increase in shipments will take place as soon as the Boundary Falls and Greenwood smelters closed from scarcity of coke since the coal miners' strike was on, resume operations. Coke shipments are now being forwarded to both smelters. The Granby Smelter can only secure enough to supply 3 furnaces. Since the settlement of the strike the Crow's Nest Pass Coal Company has advanced the price of coke 50c. a ton. This means a large increase in expenses to the smelters.

Snowshoe.—The work of deepening the main 3-compartment shaft now employs two shifts of men. The shaft is below the 3d level, and it will for the present be deepened some 30 or 40 ft. A Knowles station pump was installed at the 3d level. The new electric 150-h.p. hoist is in position at the main shaft, and as soon as the transformers are in place the hoist, the largest in the Boundary, will be ready for business. The ore will be hoisted in 2-ton skips. Anthony J. McMillan, managing director of the Snowshoe, is in Rossland, after spending the winter in England.

BRITISH COLUMBIA—EAST KOOTENAY DISTRICT.

Crow's Nest Pass Coal Company.—Men have been put at work as fast as room could be found for them. At the commencement of the strike the company had a large amount of coke which had been placed on the cars. As soon as the strike was settled this coke was shipped out to the smelters. There has been some delay in coal shipments, as at Michel and Coal Creek the lower levels of the mine were flooded. The present agreement with the miners is virtually a 3-year one, and no danger of further friction is anticipated. The company is pushing development as fast as possible, and at all the coal camps the season will be a busy one. Contracts have been let for 250 coke ovens each at Michel and Morrissey. The transfer of the stores formerly held by the company is completed, and they were now altogether in the hands of Trites, Wood & Co.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—Following are the shipments for the week ending April 18: Le Roi, 2,805 tons; Center Star, 1,525; War Eagle, 835; Le Roi No. 2, 385. Total for week, 5,700; year to date, 109,091 tons.

Le Roi.—Ore is being broken and hoisted from the 1,050 level of the Le Roi, where the strike was made a few weeks ago. The permanency of the strike is said to be settled. The ore is high grade.

Velvet.—The management reports shipments from January 1 to March 31, of 2,075 tons ore, yielding 1,507.2 oz. gold, 1,867 oz. silver and 147,933 lbs. copper. The returns from smelters were $30,390.

War Eagle.—Manager E. B. Kirby, of the War Eagle and Center Star, has been in San Francisco looking into various milling processes and securing figures on machinery.

ONTARIO—MANITOU DISTRICT.

(*From Our Special Correspondent.*)

Giant Gold Company.—This company, of Buffalo, N. Y., is at work on what is said to be a good quality of ore.

Interstate Consolidated Mineral Company.—This company, owner of the Big Master Mine, has resumed work. Its property was closed last winter on account of shortage of fuel. Over 4,000 cords of wood are being delivered. The company has disposed of its 10-stamp gravity mill and mill site, compressor plant and hoist to the Jubilee Gold Mining Company, and intends installing a more powerful compressor and hoist, and a larger stamp mill. It will also build a cyanide plant. The new mill will be erected on a more favorable site. The ore from the Big Master will be crushed at the present mill until the new one is ready. The Gold Standard Company, of Morris, Man., the National Gold Mining Company, of Detroit, Mich., and the Reliance Company are also at work.

YUKON TERRITORY.

Joseph Ladue Gold Mining and Development Company, of Yukon.—Vice-Chancellor Stevenson, of New Jersey, granted a preliminary injunction restraining this company from dissolving and reorganizing under the laws of South Dakota, on complaint of Samuel Blackwell, of Brooklyn, N. Y., who says that he bought 2,000 shares of the company at par, $10 per share, on February 24. Three days later he received from the company a letter saying that plans had been completed for the reorganization under the laws of South Dakota.

SOUTH AMERICA.

BRITISH GUIANA.

The Mines Department reports the production of gold, upon which royalty was paid, at 8,385 oz., against 8,220 oz. in March, 1902; an increase of 165 oz., or 2 per cent.

MINING STOCKS.

(Full quotations are given on pages 653 and 654.)

New York April 22.

Buying of copper stocks by the speculative pools is again in evidence, but it is not as prominent as had been expected, when the prediction was made a short time ago that Amalgamated would increase its quarterly dividend. To the chagrin of the boomers Amalgamated has declared only the regular dividend of ½ of 1 per cent, and Anaconda 50c. semi-annual.

Sales of Amalgamated this week were recorded at $64¾@$66½, and of Anaconda at 108 to 110 per cent ($27@$27½). Curb coppers were generally weak. Greene Consolidated, of Mexico, showed large selling down to $22, owing, it is claimed, to friction in the management of the company. Tennessee went off from $30¼@$29¾, while White Knob, of Idaho, recovered from $12¼@$13⅜.

Ontario Silver, of Utah, brought $6, but trading is limited. Portland Gold, of Cripple Creek, Colo., is up 5c. at $1.45, and Elkton to 40c., but Isabella is still in the dumps at 18c.

More has been done in the Comstock stocks, but prices have a tendency to keep down, notwithstanding the sanguine expectations of holders. Consolidated California & Virginia moved at $1.50, Caledonia at $2.55, Best & Belcher at $1.90@$1.85, and Ophir at $1.65@$1.70. Eight companies are collecting assessments this month of 5c., 10c. and 15c. per share, aggregating $107,160.

The New York Stock Exchange opened its new building in Wall Street on Wednesday, April 22, with ceremonies appropriate to the occasion.

Boston. April 21.

(*From Our Special Correspondent.*)

The mining share market has improved within the week in sympathy with the general trend of affairs marketwise, and stocks are back in most cases to where they were before the last break. There is plenty of room for improvement, however, and if the metal continues to maintain its present strength, the share market should mend, barring unforeseen accidents. This, at least, is the consensus of opinion. The sickness of Mr. H. H. Rogers was reflected in prices to an extent, and if his illness should take a turn for the worst it would certaintly prove a shock to the market temporarily at least, although he has able lieutenants, and they are in evidence at the present time.

Copper Range Consolidated recovered sharply from its $56 price, and touched $68 to-day, closing $1.50 below this. This stock moves easily, and when it starts the traders help it along either way. It is expected that an important announcement will be made in this stock most any time now.

The first annual report of the United States Mining Company was issued last week, and shows a satisfactory condition of affairs. Three changes were made in the board, and as a result a $2 advance was recorded in the stock, which touched $26. Mr. E. N. Foss, Frederick Ayer and N. W. Rice are the new men, and they, with the other directors, constitute one of the strongest mining boards of any property in Boston. The report states that the companies ought to earn $1,500,000 this current calendar year. The $500,000 debt will be all extinguished by June 1, it is expected. There are 419,200 shares issued, but pretty closely held.

The enforced purchase of 100 shares of United Copper in the local exchange under the rule at 30 one day last week calls attention to the narrow market in this security, and in what few hands the stock is held. There was some talk of throwing it off the list.

Bingham Consolidated has advanced $3 to $32, in the week, Centennial $4.75 to $26.75, Mohawk $6 to $54.50, Osceola $4.50 to $69.50, Shannon $1.37½ to $14.62½, and Utah Consolidated $2.12½ to $29.87½. These have been the most active stocks traded in. Tamarack rose $15 to $155 on light trading, but subsequently lost $5. Parrot rose $3.50 to $30, losing $1; Trimountain, $3 to $93; Old Dominion, $1 to $18.25, and Wolverine, $5 to $75. Mass Mining gained a fraction of a dollar in $10.12½. The Michigan will use one head of stamps at the Mass mine, as the latter cannot supply stock to two heads. Adventure has lost $1 to $9.

Colorado Springs. April 18.

(*From Our Special Correspondent.*)

The market closed considerably higher to-day than a week ago, with a stiff undercurrent of strength. Trading held well, although not at any time large. Elkton sold a week ago at 37@36½c., closing to-day with no sales, at 37⅛c., bid, and 38c. asked. El Paso sold at 59@58½c. a week ago, but was a light trader this week, with nothing new of consequence transpiring at the mine. Isabella, which sold at 16½c. a week ago, lost its grip and closed to-day at 15¾c. bid, with 16c. asked. Portland made the greatest gain among dividend-paying stocks this week, selling at $1.33 a week ago, but

up to $1.37½@$1.38½ at the end of to-day's trading. Vindicator was quoted at 96c.@$1.05 seven days ago, but when it came to selling went at $1 today, which was a strong price. The prospect stocks were generally active during the week, but presented nothing of an exceptional nature, either in prices or volume of trade.

Salt Lake City. April 18.

(From Our Special Correspondent.)

The week has been dull, and the market list has dropped a few points. The trading has been light and confined to fewer stocks than usual. The stronger stocks on the board have varied but few points, and have maintained their regular limits. There has not been much outside buying, and the trading among the insiders was heaviest in Lower Mammoth,which recorded 23,000 shares, at an advance of 10 points over last week. At the close Eagle & Blue Bell made a run on 4,575 shares, and advanced to $1.11½@90c., while the last sales made a few weeks ago reached 79¼c. Con. Mercur again lowered its limit and reached $1.46—with no one knowing why—on the transfer of 6,965 shares. Daly-West and Daly-Judge were light traders, the latter receding to $8.55 on sales of 3,955 shares. Of the unlisted stocks, Comstock, of Park City, advanced to $1.60, while Naildriver, of the same camp, stands at $1.82@$1.75; Montana-Tonopah, at $1.15@$1, with sales of 1,900 shares; Majestic, of Beaver County, records 250 shares at $3. The total business amounted to 128,978 shares, which brought $182,407.

San Francisco. April 18.

(From Our Special Correspondent.)

Early in the week the market developed somewhat lower prices, especially in the North End Comstocks. The Gold Hill stocks were better sustained. Some quotations noted are: Ophir, $1.75; Consolidated California & Virginia, $1.60@$1.65; Mexican, $1.15@$1.25; Sierra Nevada, $1; Silver Hill, 85c.; Hale & Norcross, 60@65c.; Gould & Curry, 45@46c.; Potosi, 27c.

The new Tonopah stocks were traded in rather sparingly. Tonopah Union sold at $1.25; North Star, 50c.; Gold Mountain, 20c.; Lucky Tom, 20c.

The sworn reports of the mining companies, filed in their offices on Monday of this week, show cash on hand April 1, as follows, with all expenses paid, unless otherwise noted: Andes, $7,470, with $3,122 due on electric hoist contract; Alpha Consolidated, $270; Belcher, $16,387, with indebtedness of $1,000, and March expenses unpaid; Best & Belcher, $160, with bills payable of $7,500; Bullion, $2,164; Caledonia, $147, with $1,218 due treasurer and March expenses unpaid; Consolidated California & Virginia, $2, with $5,000 due bank; Challenge Consolidated, $1,311; Consolidated Imperial, $1,548; Crown Point, $8,915, with March expenses unpaid; Confidence. $1,138, with March expenses unpaid; Chollar, $417; Gould & Curry, $3,329, with bills payable of $7,500, and liabilities of $4,183; Justice, $3,306; Julia Consolidated, $1,409; Mexican, $2,361; Ophir, $5,528; Overman, $336, with $2,446 due treasurer and March expenses unpaid; Potosi, $26; Savage, $5,582; Sierra Nevada, $1,597; Segregated Belcher, $3; Silver Hill, $19,374; Standard Consolidated, $107,610, with March clean-up and March expenses to be accounted for; Syndicate, $2,143; Union Consolidated, $5,063; Utah Consolidated, $121.

The following companies report no cash, but indebtedness as shown: Alta, $1,378; Consolidated New York, $283.

Companies in the above list having assessments in course of collections are: Best & Belcher, Caledonia, Consolidated New York, Gould & Curry, Ophir, Overman, Potosi and Segregated Belcher.

A fair business was done in oil stocks, but there was rather a weak feeling, and some buyers are apparently holding back in expectation of lower prices. Home sold at $2.75; Monte Cristo, $1.35@$1.40; Clairmont, 70c.; Pittsburg, 43@45c.; Reed Crude, 33c.; Monarch, 27c.; Independence, 12c.; Junction, 6c. Trading was chiefly in the lower priced stocks.

COAL TRADE REVIEW.

New York, April 22.

ANTHRACITE.

There is little change in the general condition of the anthracite trade. Demand is strong and widespread, and consumers cannot get a considerable proportion of the coal they wanted at April discounts. Lake navigation is getting into full swing with the end of the strike of the oilers and firemen on Lake steamers and a heavy tonnage of anthracite is going forward. The Lehigh Valley and the Erie roads have been preparing for this by storing coal at Buffalo so that steamers may not have to wait for the arrival of cars when a few hundred tons of a certain size are needed to complete a cargo.

The proprietor of three sensational newspapers, who is apparently seeking political power and loses no opportunity to show, in scare type, that he is the stern foe of trusts, has succeeded in getting a hearing before the Interstate Commerce Commission, and his counsel is now endeavoring to show before that body that the various anthracite railroads have conspired to oppress the public by combining to regulate the price of coal and prevent competition in the trade. The case is generally thought in the trade to be a sort of fishing excursion on the part of the plaintiff. For there are no indications that anything will be brought out at the hearings that was not brought out in the case of Coxe Brothers vs. the Lehigh Valley Company fourteen years ago, and more recently by the hearings before the Industrial Commission and during the sittings of the Anthracite Arbitration Commission.

Trade in the Northwest is opening with the arrival of anthracite at the head of the lakes, and the movement from the docks promises to be brisk. At Chicago anthracite is now arriving in considerable quantity, but the delay due to vessels being tied up by the strike will prevent most dealers getting much coal at the April discounts. Along the lower lakes and in Canadian territory there is more activity than farther west, while, as has been the case before, dealers at inland points in the East and at tidewater points are most active in trying to get coal as early as possible. Retail trade at New York, Philadelphia and Boston is good, householders taking advantage of spring discounts to lay in supplies early instead of waiting until fall.

There has been some trouble at a number of the Reading collieries over the interpretation of a 9-hour day. The trouble will probably be adjusted amicably.

BITUMINOUS.

The Atlantic seaboard bituminous trade is dull and weak. Plenty of coal is arriving at tidewater, and prices have fallen, the current figures being about $2.75@$2.90, f.o.b. New York Harbor. Orders seem scarce—but they are normally at this time of the year when the new contracts are not in good working shape and old contracts are filled. Most middlemen and yards and some consumers are taking all the anthracite they can get in order to have the benefit of spring discounts, and are neglecting soft coal. This activity in anthracite is expected to influence the bituminous trade for some months. At the same time current quotations on ocean freights are considered high, and there is some question whether it is not better for consumers and dealers at points beyond Cape Cod to wait until freight rates fall in a month or so before doing much ordering. New contracts are still offered, but the fall in current prices makes consumers slow to close. On the basis of these quotations, allowing 10c. for the increase to miners and 10c. for higher freights to tidewater, the producer is getting just about what he received at this time last year.

The labor question at the mines is still threatening but indications are that neither side wishes to force the issue in the fields affected, at least not now.

Trade in the far East is quiet. A few orders are received by shippers on new contracts, but not enough to take care of all the coal produced. Accordingly, all shipments on this business are being cut down. Trade along Long Island Sound is quieter than at any time this year, as dealers are paying attention to anthracite. New York trade is taking a higher percentage of coal comparatively than any other territory just now, but the trade is rather listless. All-rail trade is quiet and shipments to it have been cut down, apparently consumers have considerable stocks on hand.

Transportation from mines to tidewater takes about a week. Car supply is, on the whole, up to all demands, and the accumulation of coal at tidewater has caused the railroads to embargo car supply at certain mines. Those mines able to ship freely are able to get fully 85 per cent of the cars wanted, though the supply is rather irregular. In the coastwise vessel market vessels are scarce and in demand. The current quotations from Philadelphia are: Boston, Salem and Portland, $1.25; Long Island Sound, $1; Lynn and Gardiner, $1.40; Portsmouth, $1.30; Saco, $1.40@$1.50 and towages; Bath and Bangor, $1.30@$1.40. From New York Harbor rates are 65@75c. to Long Island Sound points, and $1 to points beyond Cape Cod.

Birmingham. April 20.

(From Our Special Correspondent.)

The Alabama district organization of the United Mine Workers of America has fixed the date for their annual scale convention. June 15. That the Alabama Steel and Wire Company has signed a contract with its miners at the Virginia City mines in this county, effective May 1, for twelve months, the miners employed by this company not being members of the United Mine Workers. The production of coal is still large in this State, with no signs of a break. The Bessemer Land and Mining Company, formerly the Bessemer Land and Improvement Company, is urging the Southern Railway and the Louisville & Nashville Railroad to build the side track to the new mines near Belle Ellen, as it is the intention of the company to begin operation of these mines as soon as possible. The tipple built by this company at these new mines is among the best in the State. In reference to the contract signed by the Alabama Steel and Wire Company with its miners for the twelve months commencing May 1, it is stated that the prices for mining and mine work are about the same as the union miners have. The signing of the scale now, as also in the case with the Galloway Coal and Coke Company, which contract went into effect April 1, means steady operation for the next twelve months. These companies do not believe that better prices will be made by the Coal Operators' Association of Alabama with the union miners. No intimation is given whatsoever as to the outcome of the scale convention of the union miners. A joint convention between miners and operators has been fixed for June 22. If the miners make demands for anything higher than they are receiving now, there will be some differences and trouble may ensue.

Chief State Mine Inspector J. deB. Hooper, who will retire from the office next month, announces that he will open coal mines in Walker County, near Oakman, on the Southern Railway. The governor will appoint Mr. Hooper's successor, and in all probability he will be John M. Gray, at present one of the assistant inspectors.

There is no change in the coke production in this State. Not less than 200 coke ovens will be started up about May 1, and a month later 100 others.

Chicago. April 20.

(From Our Special Correspondent.)

Trade is fairly good in both bituminous and anthracite, though much uncertainty is felt as to prices and few contracts with large consumers are being made. It is generally realized by the operators that their chances of profit are greater in refraining from contracts, and this spirit has spread to the large dealers, who were not without a substantial share of the profits of last winter's scarcity. From 15c. to 65c. more is being asked on Illinois contract coal for this year, on grades ranging from 90c. to $1.15 formerly. Naturally this condition makes an encouraging outlook for the independent dealer, and an unusually large number of new firms are starting in business as dealers. The fear is expressed by some dealers that this will mean reactive increase of competition, but the larger houses fear little from this source. The prospects seem to be that the dealers will handle much more coal than formerly went direct from operator to consumer.

Prices continue but slightly changed. Anthracite, still all-rail, sells at $6, the April price. Smokeless continues greatly in demand and strong at $4@$4.25. Large consumers are paying $4.50@$5 for smokeless that formerly cost them $3.85. Hocking is 25@35c. lower, being now $3.65. This is fairly active. Youghiogheny brings $3.15@$3.25; smithing coal, $3.75@$4 (in active demand); Indiana and Illinois lump and egg, $2.75@$3, for the better grades. Country trade is reported good, especially with the Northwest.

Cleveland. April 21.

(From Our Special Correspondent.)

Shippers of coal by the lakes have agreed upon the following prices for the coming year: Pittsburg coal, lump, $2.55; ¾-in., $2.45; run-of-mine, 2.35; nut, $2.35. West Virginia coal takes the same prices as Pittsburg. Ohio coal, lump, $2.40; ¾-in., $2.30; run-of-mine and nut, $2.20. These prices show advances over the quotations of last year. The sales have already been heavy beyond precedent, and some producers are taking contracts for large quantities from the upper lake region. The shipment by lake has started at a most lively pace, since the ending of the strike of the marine firemen, and the boats are all in operation or will be in a few days. The rates have remained on going charters, as they were established early in April, nothing having been said as yet about contracts for the season. The rates are 40c. to Duluth and 50c. to Milwaukee. The fuel situation of this territory has been entirely relieved. For a time it was feared that the furnaces here would be subjected to another shortage of coke because of the railroad situation, but this possibility has been almost entirely relieved by the return of the railroads to normal conditions. The market generally is strong, and there is a feeling that prices will be held up despite the usual tendency to drop during the summer.

Pittsburg. April 22.

(From Our Special Correspondent.)

Coal.—Active shipments of coal to the lakes have commenced, the coal intended for the Northwestern markets having been held up by the strike of the marine firemen. The movement of the loaded cars, which had been in the different railroad yards, began on Sunday when engines were borrowed from connecting roads and put into the service. To-day it is announced that all coal has been moved. The mines are in full operation, and there is no complaint as to a scarcity of cars, but it is not likely that this condition of affairs will continue. Prices are firm, and the demand is greater than it has ever been in the history of the coal industry in this section.

Connellsville Coke.—The supply of railroad cars continues satisfactory, and there is but little change in production and shipment. Furnace coke is quoted at $3.75@$4, and foundry at $5@$5.50. The *Courier*, in its last report, gives the production in the region for the previous week at 248,578 tons. The shipments aggregated 11,600 cars, distributed as follows: To Pittsburg and river tipples, 3,542 cars; to points west of Pittsburg, 6,240 cars; to points east of Connellsville, 1,816 cars. This was an increase of 24 cars.

San Francisco. April 18.

(From Our Special Correspondent.)

Trade has been quiet, with about the usual arrivals. Stocks are good, except in Eastern coals.

Yard prices to dealers for Pacific Coast coals in large lots are as follows: Wellington, $8.50; Southfield, $8; Rosslyn, $7; Seattle and Bryant, $6.50; Coos Bay, $5.50; white ash, $5. Rocky Mountain coals in car-load lots are quoted at $14 for Colorado anthracite, and $8.50 for Castle Gate, Clear Creek, Rock Spring and Sunnyside. Eastern coal in cargo lots is at present nominal, but quotations continue at $14 for Pennsylvania anthracite and $12 for Cumberland. Foreign coal in cargo lots sells as follows: Welsh anthracite, $13; cannel, $8.50; Brymbo, $7.50; Wallsend, $6.50.

Foreign Coal Trade. April 23.

Export trade here continues very light, while there is nothing new in imports.

Exports of fuel from Great Britain for the three months ending March 31 were as follows, in long tons:

	1902.	1903.	Changes.
Coal	9,243,955	10,332,239	I. 1,088,284
Coke	136,503	158,820	I. 22,317
Briquettes	237,930	172,995	D. 64,935
Total	9,618,388	10,664,054	I. 1,045,666

In addition to the exports, there were 3,839,463 tons sent abroad for the use of steamers engaged in foreign trade, against 3,394,570 tons last year.

Exports of coal from Great Britain to the United States in the month of March were 53,455 tons, against 4,586 tons in March, 1902.

Imports of coal at Genoa, Italy, in 1902 were 2,424,000 tons, of which 73,500 tons were from American.

Messrs. Hull, Blyth & Co., of Cardiff and London, report under date of April 10, that the tone of the Welsh coal market is steady, and prices are well maintained, both for spot loading and for after the holidays. Quotations are: Best Welsh steam coal, $3.42@$3.54; seconds, $3.36; thirds, $3.24; dry coals, $3.30; best Monmouthshire, $3.06@$3.18; seconds, $3.06; best small steam coal, $2.22; seconds, $2.10; other sorts, $1.80.

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½ per cent discount.

The outward freight rates remains unchanged. Mediterranean rates are a shade easier. Some rates quoted from Cardiff are: Marseilles, $1.65; Genoa, $1.62; Naples, $1.62; Las Palmas, $1.62; St. Vincent, $1.80; Rio Janeiro, $2.40; Santos, $2.88; Buenos Aires, $1.98.

IRON TRADE REVIEW.

New York, April 23.

So far as pig iron and steel billets are concerned, the market has been entirely a waiting one. The reduction in Southern iron and other indications have lead buyers to believe that concessions can be had, and they are holding back in the hope of securing material at lower prices. Meantime, very little business is being done. The conditions at the furnaces are very much better, the railroads generally making free deliveries of coke and ore, so that furnaces are able to work up to their capacity, as a rule, and they are generally catching up on contract deliveries. The iron ore movement has been free and lake docks are generally being cleaned up, and will be in condition for the new deliveries, which will very shortly begin to arrive.

In the East some business is being done in foreign iron and steel, especially in Middlesboro pig and in German billets. The latter are being offered at a somewhat lower range of prices than was the case a few weeks ago.

There has been no special movement in finished material. Girder rails and material for electric roads are the subject of considerable inquiry, but we do not hear of any large contracts being placed. There is also some movement in plates, but buyers are rather looking for concessions which manufacturers have so far declined to make. Sheets, wire and some other products are comparatively quiet. From the West it is reported that the agricultural implement manufacturers are beginning to buy bars rather freely.

In the iron ore situation there is nothing new, and what business remains to be done for the season is being rapidly closed. The opening rates for carrying ore from Duluth, Marquette and Escanaba indicate a season rate about 10c. higher than last year.

Birmingham. April 20.

(From Our Special Correspondent.)

Indications point to the "waiting game" being practiced quite extensively again by consumers who deal in the Southern pig iron market. Notwithstanding this, the furnacemen declare that they have no apprehension that there is going to be an accumulation of iron during this year. Sales for the last half of this year's delivery in iron have so far been very slow, but before that time comes it is believed that there will be a strong demand, and there will be no falling off in the lively shipments which are now being enjoyed.

The Sloss-Sheffield Steel and Iron Company will blow in Philadelphia furnace at Florence this week, and the Woodward Iron Company will have No. 2 furnace, which has been undergoing repairs for some time, ready for the torch in the next few days. The railroads are a little slow again in moving raw material to the furnaces, but are supplying all demands for box cars with which to move the manufactured product.

Quotations show no changes during the past week. No. 1 foundry holds at $18@$19 per ton, with No. 2 foundry at $17.50 (West), and $16@$17 for No. 3, $16@$16.50 for No. 4. Gray forge is quoted at $15.50@$16, the latter figure being usually demanded.

A denial is made by President Bush of the Alabama Consolidated Coal and Iron Company of the report that his company will be interested in the proposed merger of the Mohawk Valley Steel Company, the Brunswick & Birmingham Railroad and the Brunswick Dock Company. A meeting of the stockholders of the company will be held this week in Baltimore.

The production of steel at Ensley has been off a little on account of necessary repairs of some of the open-hearth furnaces. The supply of steel for the steel rod, wire and nail mills has been a little short. The production of steel rails has not been on a big scale as yet. G. H. Schuler, of the Alabama Steel and Wire Company, gave out an important statement during the past week to the effect that by January 1, 1904, his company would be making steel at the Gadsden plant, now under construction. The foundations for the big plant are just being completed. Mr. Schuler states that contracts with the manufacturers of the machinery and other work in the plant were made with a bonus clause for early delivery and a penalty for tardiness. As soon as this plant is finished the Alabama Steel and Wire Company will be in position to furnish its own coal and coke and limestone to its own furnaces, its own pig iron to its own steel plant and its own steel billets to its own steel rod, wire and nail mills, turning out the finished product at the very lowest cost.

The rolling mills in this district continue to work steadily. No indications are apparent as to slack work at the mills in the near future. Foundries, machine shops and other iron using plants in this district report steady conditions. Several of these industries in this district during the past week were given considerable work in the distribution made by the Lookout Mountain Iron Company, which is building a furnace at Battelle, between Birmingham and Chattanooga.

Chicago. April 20.

(From Our Special Correspondent.)

The pig iron market is a falling one. To-day's quotations are 50c. under last week's, and the general feeling is that continued holding off by buyers will bring about the result they desire—lower prices. To the average buyer the cut made by the Southern combination seems to indicate the beginning of a period of low prices, and he will not take any other view of the matter until his necessities force him to it. Hence agents are complaining that trade is dull and that the combination has defeated its ostensible object—the forcing of freer buying.

Coke continues free, though little Connellsville is coming in. This accessibility of fuel at a price comparatively moderate—$7.50@$8, against $11@$12 in the worst part of the winter—is encouraging to furnace and foundry proprietors alike, but it cannot counteract the feeling of insecurity caused by the break in the price of iron. To all appearances coke will remain down for several months; the railroads have added largely to their equipment, and shortened the time of holding coke, so as to move more with a given number of cars, and more ovens seem to be coming into use constantly.

Southern iron No. 2 is quoted at $21.35@$21.85, Chicago, and Northern No. 2 at $21.50@$22, No. 1 and No. 3 bring as usual 50c. above or below these basing prices on lots similar in size and time of delivery. The above prices are for delivery in the last half of the year. There is not so much demand for speedy deliveries as formerly, and consequently premiums are lower—50c. to $2 representing the range in ordinary cases.

Cleveland. April 21.

(From Our Special Correspondent.)

Iron Ore.—The United States Steel Corporation came upon the market Monday and chartered vessel capacity to move 1,500,000 tons of iron ore. The contracts run through the season, terminating November 25. The rates were 85c. from Duluth to Lake Erie; 75c. from Marquette and 65c. from Escanaba, making a horizontal increase of 10c. over last year. Previously some going charters had been made at 85c. from Duluth and 80c. from Marquette, and it was supposed these would be the contract figures. The other shippers have not placed any tonnage, but they are expected to take some action before the week is out. The movement of ore from the lake docks to the furnace stock piles has about ended for this year, as the direct movement is beginning to be heavy. The prices of ore have not changed being based on $4.50 for bessemer old range and $4 for bessemer Mesabi.

Pig Iron.—The buying of foundry pig has continued for spot delivery, such quantities as are available being placed. The buying for second half, however, is held up for the time being, consumers still believing that a decline in prices is possible. The producers have no such notions, basing their attitude on the present firm market and the prospects for its continuance through the year. The prices remain $22 Southern Ohio furnace for No. 2, and $21@$21.50 Valley furnace for the same grade for second half. In basic and bessemer irons nothing is being done, owing to a scarcity of material for the remainder of the first half, and to a certain inertia on the part of the buyers as to second half business. The prices have not changed in the least. Bessemer is bringing $21.50@$22, Valley furnace, for first half, and $20.50@$21, Valley furnace, second half; basic is quoted at $21.50@$22 for first half, Valley furnace, and $20 for second half delivery.

Finished Material.—The structural trade is looking up, and the inquiries indicate a good volume of business in sight. The weakness which was manifest last week and prior to that, has disappeared under a buying period that is quite promising. In addition a good volume of business is immediately in sight, which promises other orders for the near future. Deliveries now depend much on the material wanted. The prices do not change, the larger mills getting 1.60c., Pittsburg, and the smaller mills 1.70@1.80c. at the mill. The jobbers are getting 2.15@2.25c. out of stock. Plates have been in fair demand, but the larger mills have not been able to take on much business. One choice order of 2,500 tons was closed during the past week. The prices are as they were, 1.60c. at the standard mills; 2c. at the smaller concerns. The buying of sheets has continued heavy, and the mills are well filled with orders. The prices are firm without change, none being expected just now. The prices remain as they were: 3.10@3.25c. for No. 27 black sheets out of stock. Bar sales have been more active of late. Two or three of the big agricultural implement works have closed for their material and other big orders are pending. The tonnage placed during the past week amounted to about 6,000 tons. The prices are firm at 1.60c., Pittsburg, for bessemer, and 1.70c., Pittsburg, for open-hearth. Bar iron is not very active, as the larger mills are not courting the business, and the smaller mills have all they care to handle. The price has held at 1.85c., Youngstown. The demand for rails is in excess of the possibilities of the mills. The prices have held firm without any further transactions. They are $28, Pittsburg, for standard, and $36 for light rails.

Old Material.—The market has been firm, with active buying in some grades; steel is scarce and there is a good call for it.

Duluth, Minn. April 20.

(From Our Special Correspondent.)

For the first week Two Harbors ore shipments were 70,000 gross tons. Men were short, and nearly every ship that went from Duluth to load had an insufficient complement of men in the firehold. Men were sent along later, and the ships started out with full crews. Union firemen attempted in every way to harass the movements of vessels, so that captains were forced to pull away from docks at night and anchor in the open harbor. The strike is now over, however, and the men are going back to work, but not all of them, as the Pittsburg Steamship Company refuses to discharge the men it took on to help out, and union and non-union men will work together. This is a very decided victory for the Pittsburg Company. Shipments will be very heavy after the coming few days. Last year April shipments from Minnesota were 985,000 gross tons, which cannot be equaled this April, but the total for the month will be so large as to make the season but little different. A good many vessel owners have not yet started their ships, notably the Gilchrist Company, with 69 large steel ships, none of which has turned a wheel. Smaller shippers than the United States Steel Corporation are ready to contract tonnage at 85c. a ton, and some of them may have done so, but the bulk

will wait till the big company makes its rate. The big company, on its part, is not anxious, for it has a lot of ore on lower lake docks, and could not take more than can be delivered by the Pittsburg Company's (its own) vessels, for a time. It is not ready to settle a price, and is making no bids. Docks are busy at every shipping port, and about all mines, even steam shovel properties, are now making shipments.

Philadelphia. April 22.

(From Our Special Correspondent.)

Pig Iron.—Transactions in pig iron have been unimportant. Consumers are awaiting to note the drift of things. The market is properly recognized as a waiting one. At the same time quite a number of inquiries for large lots of both foundry, forge and bessemer iron have appeared within a few days. Those who have received these inquiries say that they are by way of sounding the market more than with a view to order immediately. The consumers in this territory are not in urgent need, and the furnace people do not look for much business for at least a month. They are certainly making no efforts to secure business. The average range of quotations may be given at $23 for the best No. 1X foundry; No. 2, $21.50, with $21 quoted for business for mid-summer delivery; No. 2 plain is quoted at $21; gray forge is weak at $20, with $19 offered for a few lots; basic rules about $20. Very little has been done in foreign iron. Small lots of Middlesboro No. 3 have been sold at $21, while cargo lots are quoted at $19. English bessemer is quoted at $20.50; low phosphorus, $21.50.

Billets.—Billets are quoted in this territory at $32, with offers for $31; German billets are quoted at $28.50@$29, and deliveries are now being arranged for.

Merchant Bar.—Orders have been accumulating at mills, and the indication to-day is that when the car builders come to place large orders there will be a general drop in common iron. The market appears to be getting ready for a shading. As it is only small buyers who are now purchasing and the selling prices do not indicate actual condition. Steel bars are 1.75@1.85c.

Sheets.—Sheets are in fairly good demand at full card rates for late deliveries.

Merchant Steel.—The market is about as it has been for some weeks past. The larger buyers are not in the market at present. Smaller consumers continue to buy in a hand-to-mouth way. Ordinary grades of open-hearth steel are quoted at about 2c. in a small way.

Pipes and Tubes.—The tube market is very strong; consumption continues heavy. Merchant pipe is very strong.

Plates.—Nothing of importance has taken place. The usual run of small orders is noted. Quotations for ¼-in. are 1.90c.; universals, 1.95c.; flange, 2.10c.; marine, 2.20c.; fire-box, 2.30c.

Structural Material.—Ordinary sizes of beams, angles and channels are quoted at 1.73½@1.78½c., but these quotations have no reference to the small business that we are booking at present.

Steel Rails.—Girder rails are attracting attention of buyers and the business done this week is indicative of a very active demand.

Old Rails.—Old steel rails have been asked for this week and $21.50 has been offered. Old iron rails are quoted at $25, and would sell on sight.

Scrap.—There have been several inquiries within a few days for low phosphorus scrap for which $27.50 is offered.

Pittsburg. April 21.

(From Our Special Correspondent.)

There is little new in the iron and steel markets this week, the offering of Southern pig iron at lower prices and the operation of the blast furnaces here to their full capacity having caused buyers to delay placing orders in the expectation of a decline in prices. The furnaces are all sold for several months ahead, and are not ready to cut rates in order to take on new business. A few sales, however, are recorded this week at prices slightly lower than have been quoted, and it is reported that dealers in the Southern product are shading the low prices at which iron was offered on April 1. The low quotations, however, have not induced buying, and but few sales of Southern iron are noted. But one sale of any importance of Northern iron was made this week at a concession from former prices. It is now believed that for late delivery, Valley furnaces would shade the $20 rate which it had been expected would be the minimum for the rest of the year. Valley iron at a higher price is still preferred in this district to the Southern product. The coke movement during the past week has been all that could be desired and furnaces have had the full requirements for the first time in over six months. This may not continue, owing to heavy shipments of coal now being made to the lake ports.

In the finished lines the market is unusually strong and the scarcity of steel is greater. Better prices are being obtained for sheets and tin-plate, and it is expected that the American Sheet Steel Company will order an advance in black sheets before the end of the week. A heavy tonnage of prompt steel has been sold within the past week, the principal buyers being independent sheet and tin-plate makers. Some sales were made on a sliding basis of 50 per cent above the current price of pig iron. The United States Steel Corporation is having difficulty in supplying steel to some of its finishing departments, and is again considering the changing of some mills from rails to billets, but the rail orders at present are urgent, and other means for obtaining steel must be adopted. The plate mills have all the business they can handle for several months, and premiums ranging from $3 to $5 a ton is being paid on new business for prompt shipment. The steel bar market is very active, and some new orders were booked this week. Specifications from agricultural implement manufacturers are coming in, and the entire year's requirements may be placed within the next few weeks. The business from this source is expected to be somewhat heavier than last year, although it has been reported that there might be a falling off.

The strike of the bridge and structural iron workers seems to be nearing an end, and when it is ordered off there will undoubtedly be a boom in building operations. Conflicting reports have come here from New York as to the situation. It is officially given out at the headquarters here of the American Bridge Company that no conference has been held, despite the reports emanating from the strike leaders. The workers seem anxious to settle with the bridge combine in order to avoid a conflict on May 1, when they expect to establish the new wage scale, which provides for an advance from 47½ to 50c. an hour, and some strict working rules which are objectionable to the contractors. The iron and steel erectors have formed a strong association, and the International Association of Bridge and Structural Iron Workers may have some difficulty in enforcing extravagant demands this time.

The wage scale for the year beginning July 1 is under discussion at the annual convention of the Amalgamated Association of Iron, Steel and Tin Workers in session at Columbus this week. From an official source it is learned that an advance will not be asked in the iron and tin-plate scales, but a number of additional foot-notes are likely to be presented to the manufacturers when the annual conferences are held. The sheet workers are urging the convention to make a demand for a 10 per cent advance. They contend that as they have had no change in wages for several years, owing to the price of sheets having been kept around the base of the scale, they are entitled to a raise. The puddlers have greatly benefited under the sliding scale on account of the demand for and price of bar iron being extremely good, but some of the lodges have sent delegates to the convention with instructions to ask for an increase. In some instances the demand being urged calls for an advance over the present high rate for puddling of 75c. a ton, and a proportionate increase for the finishers. These propositions, however, are not expected to be entertained by the convention.

Pig Iron.—Several small sales of bessemer pig iron have been made at slight concessions over former prices, but only one sale of importance is noted. It was for 10,000 tons for extended delivery and the price named was $19.90, Valley furnaces. Southern iron is offered this week at a slightly lower rate, but no sales are recorded. Gray forge is still quoted at $20.50, Pittsburg, and it is preferred even at that price to the Southern forge at $19.85. Foundry iron is quiet, the foundries being covered up to July 1, and but little buying has been done for second-half delivery. No. 2 is still quoted at $21.50@$22, Pittsburg, for the second half.

Steel.—The demand continues heavy, but sales were not as large as the previous week. Bessemer billets are selling at $30.50@$31.50, and open-hearth billets are quoted at $31@$32. The good demand for plates and bars continues, and the base price remains at 1.60c. The structural mills are all busy. There is not much new business, the strike of structural iron workers having delayed buying.

Sheets.—The sheet market is active, and some independent mills are getting premiums for prompt deliveries. It is believed the American Sheet Steel Company will advance the price of black sheets this week. No. 28 gauge has been quoted at 2.75c. for several months, and galvanized at 3.85c. Corrugated roofing has advanced 10c. a square. This is the second advance this year.

Ferro-manganese.—There is no change in the market, English ferro-manganese still being quoted at $50@$52.50.

New York. April 22.

Pig Iron.—The market is quiet, very little is being done in foreign pig. We quote for early delivery, Northern iron at tidewater: No. 1X foundry, $22.50; No. 2X, $21.50; No. 2 plain, $20.50. For Southern iron on dock, New York: No. 1 foundry, $21.75; No. 2, $20.75; No. 3, $20.25.

Bar Iron and Steel.—We continue to quote for large lots on dock: Refined bars, 1.95@2c.; soft steel bars, 1.80@1.90c.

Plates.—Demand is light, and no business of importance is expected until after May 1, owing to the attitude of labor organizations. Tank, ¼-in. and heavier, is quoted at 1.85@1.95c.; flange, 1.95@2c.

Steel Rails.—The quotation remains $28 for standard sections, f.o.b. mills for 1903 delivery; light rails, $32@$36, according to weight. Relaying rails are $28@$30 for heavy sections and $33@$35 for light sections.

Structural Material.—The market is fairly active, considering the attitude of labor organizations and the possibility of strikes on May 1. We quote for large lots at tidewater: Beams, angles, channels and tees, 1.75@2c.

Cartagena, Spain. April 4.

(Special Report of Barrington & Holt.)

Iron and Manganiferous Ores.—Since last report there have been no shipments of ores from this port. A fair amount of tonnage has, however, been taken up for loading within the next 15 days, and some of the freights paid have been Cartagena to Rotterdam, 7s. 6d.; Middlesbrough, 7s. 9d., and Tyne, 7s. 6d., full terms. Inquiries for ordinary dry ore have been quiet, but there has been some demand for low-grade manganiferous ore and Calasparra magnetic ore.

Prices are firm at 6s. 9d.@7s. per ton, f.o.b. shipping port, for ordinary 50 per cent ore; 7s. 3d.@7s. 9d. for special low phosphorus; 9s. 3d. for 58 per cent specular ore. Magnetic ore, 60 per cent iron, is 11s. for lump and 9s. 6d. for smalls. Manganiferous ores range from 14s. 6d. for 20 per cent manganese and 20 iron, to 9s. 9d. for 12 manganese and 35 iron.

Pyrites.—Iron pyrites, 43 per cent sulphur and 40 per cent iron, are quoted at 10s. 6d. per ton. No shipments are reported for the week.

CHEMICALS AND MINERALS.

(See also Prices-Current on page 656.)

New York, April 23.

Signs of improvement are noticeable in many sections, and, judging from the present rate of consumption, a satisfactory business will be done this year. Prices, however, will show some variation, notably for raw materials and a few heavy chemicals.

Export trade is looking up. In March shipments from New York included 54,515 lbs. pot and pearl ashes, 1,005,726 lbs. zinc oxide, 59,441 lbs. salt, 5,582 bbls. cement, $6,462 asbestos, and $41,327 zinc dross, the latter chiefly to Great Britain and Germany. In the quarter ending March 31 there were exported through this port 1,615,177 lbs. bicarb. soda, of which 459,108 lbs. were for Great Britain, 374,204 lbs. for Australia and New Zealand, and 403,200 lbs. for Japan; and 799,106 lbs. caustic soda, of which 451,465 lbs. went to Japan. Last week 288,000 lbs. talc were exported to France, and 168,000 lbs. to Belgium from Atlantic ports.

The United States Steel Corporation produced 14,224 tons copperas in 1902, and 486,357 tons slag cement; the market for both articles is largely controlled by the Steel Trust.

The Badische Anilin und Soda Fabrik, of Germany, which does quite some business with America, has increased its dividend from 24 per cent in 1901 to 26 per cent for 1902.

Cyanide of Potassium.—Imports are moderate, but exports continue. Recently 47 cases of cyanide were shipped to Colon, and 10 cases to Halifax, Nova Scotia. Quotations by first hands average about 20c. per lb., f.o.b. New York.

Bleaching Powder.—Consumption is good, and has been encouraged by the low prices at which season contracts were booked. New orders are few, hence second hands are anxious to make sales even at a recession in price. Foreign prime bleach is quoted at $1.12½@$1.25 per 100 lbs., f.o.b. New York, and domestic at $1@$1.20, f.o.b. works, according to test. It is noteworthy that British exports to this country are increasing, and constitute fully 85 per cent of the American imports. In March the exports to the United States amounted to 8,889,440 lbs. Since January 1 the quantity has been as below. An approximation of the chlorine content is also given in pounds.

	1902.	1903.	Changes.
Bleaching powder	22,526,336	24,791,200	I. 2,264,864
Chlorine content	7,884,217	8,676,920	I. 792,703

The increase this year is equivalent to about 10 per cent. This would indicate that British manufacturers are determined to compete strenuously with the German and other Continental makers.

Chlorine is quiet at 30c. per lb. for liquid, f.o.b. New York, and 10c. for water.

Copper Sulphate.—Export trade cannot compare with last year, as business with some countries has been suspended, owing to the limited production and the keen competition with British makers. In fact, domestic trade pays better, and copper refiners are disposed to give it more attention. Exports from New York in March aggregated 5,103,444 lbs., principally to Italy, and had an average invoice value of $4.18 per 100 lbs. Since January the exports from this port have been as follows:

	1902.	1903.	Changes.
Austria	2,134,205	3,470,168	I. 1,335,963
Belgium	33,750	135,692	I. 101,942
Italy	7,355,312	5,684,902	D. 1,670,410
Portugal	24,940	67,900	I. 42,960
Oen. & So. Am.	302,630	240,181	D. 62,449
Other countries	2,255,024	56,197	D. 2,198,827
Total lbs.	12,105,861	9,655,040	D. 2,450,821
Value	$485,942	$372,578	D. $113,364

The falling off in exports this year is equivalent to 20.2 per cent, due chiefly to smaller buying by Italy.

A feature to cause some concern to domestic makers is the persistency with which importers of the British article are trying to establish a foothold in the American market. Therefore, they are quoting practically the same prices as Americans, $5.25@$5.37½ per 100 lbs., notwithstanding the import duty of ½c. per lb. Incidentally, it is interesting to note that exports from Great Britain to all countries have grown enormously since the recession of Americans. In March the British shipments aggregated 27,292,160 lbs., which is a larger total than was reported for January and February together. In the first three months this year the exports amounted to 54,028,800 lbs., as against 30,419,200 lbs. in the same period last year; showing an increase of 23,609,600 lbs., or 77.5 per cent. These shipments have been made at a higher average invoice value than the American, but they are on the other hand a little lower than last year. The more important consumers of the British article are France, Italy, Spain and Greece.

Acids.—Buying is seasonably good, and prices remain unchanged. We quote as below per 100 lbs., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Muriatic, 18°..	$1.50	Oxalic com'l...	$5.25@$5.50
Muriatic, 20°..	1.60	Sulphuric, 50°,	
Muriatic, 22°..	1.75	bulk, ton....	13.50@14.50
Nitric, 36°....	4.37½	Sulphuric, 60°.	1.05
Nitric, 38°....	4.75	Sulphuric, 60°,	
Nitric, 40°....	5.00	bulk, ton	18.00@20.00
Nitric, 42°....	5.37½	Sulphuric, 66°,	1.20
		bulk, ton	21.00@23.00

Brimstone.—New business is scarce and of small volume. Sales of best unmixed seconds from steamer were made at $22.25@$22.75 per ton, while futures are quoted $22@$22.25. Best thirds are nominally $1@$1.25 per ton less than seconds.

Imports of brimstone into Great Britain in March amounted to 1,458 long tons, making 4,457 tons for the first quarter this year, against 5,872 tons in 1902; showing a decrease of 1,415 tons, or 24 per cent. The greater part of the sulphur consumed in the kingdom is recovered from Spanish pyrites.

Sicilian Brimstone Market.—Advices from Messrs. Emil Fog & Sons, of Messina, under date of March 31, state that the brimstoue market remained firm throughout the month. Stocks at Girgenti at end of February fell to 120,800 tons, as against 138,000 tons in 1902. Speculation has ceased entirely; but buying of futures is prevented by the certainty of easier prices. The news that two Norwegian pulp manufactories, the Hapslund Pulp Company and the Kellner Partington Paper Pulp Company, Tannesund, changed their plants to burn pyrites is confirmed.

Quotations, per long ton, f.o.b., are as follows: Best unmixed seconds in bulk, 82s. 9d.; best thirds, bulk, 79s. 6d.; current thirds, bulk, 78s. 6d.; refined block sulphur, 87s. 9d.@91s. 3d.; refined roll sulphur, 94s. 3d.@96s. 9d., and in sticks, 103s. 6d.@105s. 6d.; sublimed flowers, pure, in bags, 108s.; sublimed flowers, current, in bags, 97s. 3d.; sublimed flowers, commercial, in bags, 94s. 9d. Several steamers in want of return freights are still offering at low rates, New York, 7s. 3d.; Baltimore and Boston, 7s. 6d.; Philadelphia, 8s.; Canadian ports, 8s. 6d.; San Francisco, lots of at least 25 tons by steamer to Antwerp and thence by sailer, at 31s. per ton.

Pyrites.—Domestic consumption continues satisfactory, and good prices are obtained on extension contracts. The Pennsylvania Salt Manufacturing Company imported 3,956 tons Spanish copper pyrites at New York this week.

Imports of copper and iron pyrites into Great Britain in March amounted to 70,359 long tons, which shows an increase over 1902. For the three months the imports were as below, in long tons:

	1902.	1903	Changes.
Pyrites	172,564	196,256	I. 23,692
Sulphur content	81,105	92,240	I. 11,135

The increase this year is equivalent to nearly 14 per cent. The invoice value of the pyrites imported in March averaged $8.85 per ton, as against $8.45 in 1902; an increase of 40c.

We quote: Domestic pyrites, $5 per ton, for lump ore, f.o.b. Atlantic coast mines, and 10c. per unit for fines; sulphur content varies from 42@44 per cent. Spanish pyrites, carrying from 46@52 per cent sulphur, are quoted at 12@13c. per unit for lump, and 10@11c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—The market is firmer in all positions, owing to the increased consumption both here and in Europe, and to the decrease in the visible supply. Spot is quoted at $2 per 100 lbs., and futures, $1.90. Freight rates are stronger. Cables give the shipments in April to Europe at about 1,000,000 quintals, and to the United States at 390,000 qtls. The combination will probably not fix the respective quotas of production for its third year until some time next month; but it is likely that the basis will be the consumption during the past twelve months. In that event importers believe prices will be maintained. The production in the calendar year ended December 31, 1902, is officially reported at 1,350,325 long tons, while the exports were 1,362,085 tons, and the world's consumption, 1,285,645 tons. The visible supply on December 31, 1902, is given as 994,365 tons, of which 746,116 tons are for export and 248,249 tons stocks on the coast. It is gratifying to mention that these figures differ little from the estimates given in the ENGINEERING AND MINING JOURNAL on January 3, 1903. The smallest difference in the JOURNAL's figures is 11,576 tons, or less than 1 per cent in exports. There were 78 oficinas operating in December, 1902.

The statistical position of nitrate of soda in Europe in March and the first quarter of this and last year, is shown below, in long tons:

	March.	—Three months.— 1902.	1903.
Exports to Europe	64,398	297,746	254,744
Imports	155,960	311,780	394,040
Deliveries	242,840	387,790	512,330
Load. for Europe April 1.	42,099	.....	.....
Vis. supply, April 1	397,710	.....	.....

Notable changes this year are an increase of 124,540 tons, or 32 per cent in deliveries, and a decrease of 121,660 tons, or 23 per cent in the visible supply on April 1. The deliveries are fully 14 per cent larger than 1901, and about 9 per cent more than 1900.

Sulphate of Ammonia.—Little doing to attract attention. Spot gas liquor brings $3.20 per 100 lbs., and shipments $3.15.

Phosphates.—Favorable weather has initiated increased activity in mining centers, and a better car supply has facilitated railroad transportation. In Florida land pebble people are very busy. Recently a cargo of 2,700 tons pebble, having an average invoice value of $6 per ton, was sent from Tampa by Joseph Hall to Yokohama, Japan. The ocean freight was 20s. ($4.80). In Tennessee much work is being done on properties in Maury and Hickman counties. The Virginia-Carolina Chemical Company, the Southern fertilizer combination, has planned building a railroad from Ashwood to Allen Harlan's farm, in Maury County, about 5 miles, to assist in developing the phosphate land. Reports, to be substantiated, state that the S. M. Ward property at Swan Creek, near Centerville, in Hickman County, has been optioned for $75,000 to Chicago people. Strange that the Ward Company should option its property so soon after it made a contract with the Charleston Mining and Manufacturing Company, for 70,000 tons of phosphate rock to be delivered when the necessary railroad connection has been made with the mines.

Phosphate prices are as follows:

Phosphates	Per ton F. o. b.	United Kingdom or European Ports. Unit.	Long ton.
*Fla. hard rock (78@80%).	$6.50@$7.00	6⅝@7¼d.	$10.47@11.46
*Fla. land peb. (68@73%)..	3.25@ 3.50	5½@5⅝d.	7.70@ 8.05
†Tenn., (78@82%) export..	3.75@ 4.00	6⅝@7d.	10.20@11.20
†Tenn., 78% domestic.....	3.25@ 3.50	.....	.....
†Tenn., 75% domestic.....	3.00@ 3.25	.....	.....
†Tenn., 73@74% domestic...	2.50@ 275	.....	.....
†Tenn., 70@72% domestic...	2.25@ 2.50	.....	.....
‡So. Car. land rock.....	@ 3.25	.....	.....
‡S. Car. riv. r'k (55@60%)	2.75@ 3.00	5¼@5⅝d.	5.95@ 6.24
Algerian (63@68%)	.....	5¼@6¼d.	6.83@ 8.02
Algerian (58@63%)	.....	5¼@6d.	6.15@ 7.26
Algerian (53@58%)	.....	4⅞@5d.	5.41@ 5.55
Gafsa (Tunis)	.....	4⅞@5d.	5.41@ 5.55
Christmas Is. (80@85%)..	.....	7⅛@7⅝d.	11.76@12.58

* Fernandina, Tampa, Brunswick or Savannah.
† Mt. Pleasant. ‡ On vessels, Ashley River.

Liverpool. April 7.

(*Special Report of Joseph P. Brunner & Co.*)

Heavy chemicals continue quiet, while quotations are mostly without change.

Soda Ash.—For tierces, nearest values are about as follows: Leblanc ash, 48 per cent, £5 15s.@£6; 58 per cent, £6 2s. 6d.@£6 7s. 6d. per ton, net cash. Ammonia ash, 48 per cent, £4 5s.@£4 10s.; 58 per cent, £4 10s.@£4 15s. per ton, net cash. Bags, 5s. per ton under price for tierces.

Soda Crystals are unchanged at £3 7s. 6d. per ton, less 5 per cent for barrels, or 7s. less for bags, with special terms for a few favored markets.

Caustic Soda continues firm, as follows: 60 per cent, £8 15s.; 70 per cent, £9 15s.; 74 per cent, £10 5s.; 76 per cent, £10 10s. per ton, net cash. Special terms for the Continent and a few other export quarters.

Bleaching Powder is dull, and orders are scarce. For hardwood, £4@£4 5s. per ton, net cash, is about nominal range, but prices vary as to destination.

Chlorate of Potash is steady for English make at 2⅞@3d. per lb., net cash.

Bicarb. Soda is in fair request at £6 15s. per ton, less 2½ per cent for the finest quality in 1-cwt. kegs, with usual allowances for larger packages, also special terms for certain favored markets.

Sulphate of Ammonia is less active, but quotations are nominally unchanged at £13 12s. 6d.@£13 15s. per ton, less 2½ per cent for good gray 24@25 per cent in double bags, f.o.b. here.

Nitrate of Soda is strong and dearer, at £9 12s. 6d. @£9 17s. 6d. per ton, less 2½ per cent for double bags, f.o.b. here, spot delivery, as to quality.

METAL MARKET.

New York, April 23.

Gold and Silver Exports and Imports.

At all United States Ports in March and Year.

Metal	March. 1902.	March. 1903.	Year. 1902.	Year. 1903.
Gold:				
Exports....	$4,432,946	$1,042,598	$15,672,101	$2,626,111
Imports....	2,636,313	4,472,061	5,739,067	8,031,666
Excess.	E.$1,796,633	I. $3,429,463	E. $9,933,034	I. $5,405,555
Silver:				
Exports....	$3,301,291	$3,063,749	$11,751,886	$11,107,679
Imports....	2,306,499	1,479,771	6,419,823	5,660,743
Excess.	E.$994,792	E. $2,183,978	E. $5,332,063	E. $6,046,936

These figures include the exports and imports at all United States ports, and are furnished by the Bureau of Statistics of the Treasury Department.

Gold and Silver Exports and Imports, New York.

For the week ending April 22, and for years from January 1:

Period.	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.	Total Excess, Exports or Imports.
Week	.....	$10,556	$166,409	$11,921	E. $143,932
1903.....	$1,347,450	2,527,448	5,787 204	387,534	E. 4,219,672
1902.....	10,437,751	1,031,880	10,456 412	439,960	E. 25,422 323
1901.....	12,379,779	942,133	11,689,738	1,248 347	E. 21,897,037

The movement this week has been principally in silver to London.

Financial Notes of the Week.

Money is somewhat easier, and the speculative markets a little more cheerful. General business is quiet, but steady, and there is no special change to be noted.

The statement of the New York banks, including the 59 banks represented in the Clearing House, for the week ending April 18, gives the following totals, comparisons being made with the corresponding weeks of 1902 and 1901:

	1901.	1902.	1903.
Loans and discounts..	$882,067,300	$894,491,400	$905,207,300
Deposits	967,201,200	952,774,200	887,290,200
Circulation	31,454,100	30,976,900	43,495,000
Specie	185,684,200	172,332,400	160,972,500
Legal tenders	71,038,200	72,439,800	66,857,700
Total reserve	$256,722,400	$244,772,200	$227,830,200
Legal requirements ..	241,800,300	238,193,550	221,822,550
Balance surplus	$14,922,100	$6,578,650	$6,007,650

Changes for the week, this year, were increases of $2,427,800 in loans and discounts, $2,459,400 in deposits, $368,600 in circulation, $2,017,800 in specie, $863,400 in legal tenders, and $2,266,350 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison made with the holdings at the corresponding date last year:

	1902. Gold.	1902. Silver.	1903. Gold.	1903. Silver.
N. Y. Ass'd.	$172,332,400	.....	$160,972,500	.....
England ...	178,469,810	.....	168,623,535	.....
France	513,295,745	$221,199,840	499,915,800	$219,641,870
Germany ...	186,675,000	69,045,000	151,230,000	53,140,000
Spain	70,440,000	91,125,000	72,355,000	10,105,000
Neth'l'ds ..	23,910,500	32,541,500	19,676,500	32,615,000
Belgium ...	15,573,335	7,786,665	15,546,665	7,773,335
Italy	80,640,000	10,631,500	88,575,000	11,369,500
Russia	362,170,000	41,435,000	382,170,000	41,815,000

The returns of the Associated Banks of New York are of date April 18, and the others April 17, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market continues strong, with rising tendency on good demand for India. The spot supply of silver in London is limited, and any demand for prompt delivery would advance prices.

The United States Assay Office in New York reports receipts of 96,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to April 8 are reported by Messrs. Pixley & Abell's circular, as follows:

	1902.	1903.	Changes.
India	£2,156,585	£2,193,500	I. £36,915
China	16,500	121,775	I. 105,275
The Straits	250	136,391	I. 136,141
Total	£2,173,335	£2,451,666	I. £278,331

Receipts for the week, this year, were £140,000 in bar silver from New York, £2,000 from Chile, and £5,000 from Australia; total, £147,000; also £41,000 in Mexican dollars from New York, and £20,000 from Vera Cruz; total, £61,000, making a grand total of £208,000. Shipments were £125,900 in bar silver to India, and £15,275 to Hong Kong; total, £141,175.

Indian exchange is somewhat firmer, and the Council bills offered in London were taken at an average of 15.96d. per rupee. Money is in better demand in India, while the higher price of silver has checked remittances in that form.

Exports of gold from Australia for the two months ending February 28 were as follows:

	1902.	1903	Changes.
Melbourne	£485,824	£1,246,985	I. £761,161
Sydney	168,212	466,259	I. 298,047
Western Australia	955,895	1,561,187	I. 605,292
Totals	£1,609,931	£3,274,431	I.£1,664,500

The shipments this year included £70,932 to China and £2,650,460 to India; the balance going to Great Britain. No shipments were made to the United States.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$.39⅜	$ 40⅜
Peruvian soles and Chilean pesos	.37	.39
Victoria sovereigns	4.85	4.88
Twenty francs	3.86	3.88
Twenty marks	4.74	4.80
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

April.	Sterling Exchange.	—Silver— N. Y. Cts.	—Copper— London, Pence.	Lake, Cts. per lb.	Electrolytic, Cts per lb.	London, £ per ton	Tin, Cts per lb.	Lead Cts. per lb.	—Spelter— N. Y. Cts. per lb.	S. L., Cts. per lb.
				14⅝	14¾			4.60		
16	4 86⅝	49⅝	22⅛	@14⅞	@14⅝	61⅞	29¾	@4.65	5.55	5.37½
				14⅝	14¾			4.60		
17	4 86¾	49¾	23	@14⅞	@14⅝	62⅛	30	@4.65	5.55	5.37½
				14⅝	14¾			4.60		
18	4 86⅞	50	23⅛	@14⅞	@14⅝	....	30¼	@4.65	5.55	5.37½
				14⅝	14⅝			4.60	5.50	5.35
20	4 87	50⅛	23⅛	@14⅞	@14⅝	62¾	30	@4.65	@5.60	@5.45
				14⅝	14⅜			4.60	5.50	5.35
21	4 87¼	50¼	23⅛	@14⅞	@14⅝	61⅞	29¾	@4.65	@5.60	@5.45
				14⅝	14¾		29½	4.60	5.50	5.35
22	4 87¼	50¾	23⅛	@14⅞	@14⅝	61½	@29⅝	@4.65	@5.60	@5.45

London quotations are per Long Ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars; the price of electrolytic cathodes is usually 0.25c lower than these figures

Copper has ruled quiet but firm throughout the week, and nothing of special interest has transpired. The ruling quotations are 14⅝@14⅞c. for Lake; 14¾@14⅝c. for electrolytic in cakes, wirebars and ingots; 14⅛@14⅜c. for cathodes; 14@14¼c. for casting copper.

The market for standard copper, which closed last Thursday at £62 2s. 6d., opened on Monday at £62 7s. 6d., and the closing quotations on Wednesday are cabled as £61 7s. 6d.@£61 10s. for spot, £61 10s.@£61 12s. 6d. for three months.

Statistics for the first half of April show an increase in the visible supplies of 1,500 tons.

Refined and manufactured sorts we quote: English tough, £65@£66; best selected, £66 10s.@£67 10s.; strong sheets, £74@£75; India sheets, £71 10s.@£72 10s.; yellow metal, 6¼@6⅝d.

Exports and imports of copper at New York, Philadelphia and Baltimore in the week ending April 21, and for the year to date, are reported by our special correspondents as follows, in long tons:

Exports:	Week.	Year.
Austria	370	2,166
Belgium	75	686
France	398	7,836
Germany	....	6,556
Holland	480	13,382
Italy	55	880
United Kingdom	310	5,527
Other countries	....	1,541
Total copper	1,688	38,574
Matte	20	98
Imports:		
Copper	515	8,019
Matte	....	300

Exports and imports this week show a decrease. Of the imports 330 tons copper were from Chile.

Tin.—After showing a somewhat firmer tendency last week, the market has turned distinctly flat. The arrival of the steamer *Hindoostan* with 1,500 tons, has considerably increased the stocks in hands of dealers here, and the metal has been selling below the parity of the London market. At the close we quote 29½@29⅝c. for spot, 29⅜@29½c. for futures.

The foreign market, which closed last week at £138 2s. 6d., opened on Monday at £138, declined on Tuesday to £137, and the closing quotations on Wednesday are cabled as £136 10s.@£136 12s. 6d. for spot, £135 17s. 6d.@£136 for three months.

Lead is quiet but steady. The ruling quotations are 4.50@4.57½c., St. Louis; 4.60@4.65c., New York.

The foreign market is somewhat easier, Spanish lead being quoted at £12 8s. 9d.@£12 10s.; English lead, 2s. 6d. higher.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 4, that the price of silver for the week has been 12.25 reales per ounce. Exchange has gone up 26 centimos, making it 33.99 pesetas to £1. The local quotation for pig lead on wharf has been 71.50 reales per quintal, which, on above exchange, is equal to £11 15s. 5d. per ton of 2,240 lbs., f.o.b. Cartagena. Exports of pig lead were 606,000 kgs. to London.

Spelter.—The market has developed quite some strength owing to the scarcity of spot metal, for which good prices are being realized. Quotations are rather irregular, ranging from 5.35@5.45c., St. Louis, 5.50@5.60c., New York.

The foreign market is steady, good ordinaries being quoted at £22 15s.; specials, £23.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 4, that blende is very firm, the price of silver having taken an upward tendency again. The production of several important mines has been sold for April at about 3s. per ton above the March rate.

Antimony is dull, without any special feature. We quote: Cookson's, at 8¼c.; Hallett's, at 6⅞c.; Hungarian, United States, Japanese, French and Italian, at 6½@6⅝c.

Nickel.—The price is now quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Platinum.—Consumption continues good, and prices are firm. Ingot platinum in large lots brings $19 per oz. in New York.

Chemical ware (crucibles and dishes), best hammered metal from store in large quantities, is worth 72½c. per gram.

Quicksilver.—The New York price is unchanged at $47.50 per flask for large lots, with a slightly higher figure quoted for small orders. The San Francisco quotation is still $44.50@$46 per flask for domestic orders, and $42@$43 for export. The London price is £8 12s. 6d. per flask, with the same quotation from second hands.

Minor Metals and Alloys.—Wholesale prices, f.o.b. works, are as follows:

Aluminum.	Per lb.
No. 1, 99% ingots	33@37c.
No. 2, 90% ingots	31@34c.
Rolled Sheets	4c. up
Alum-bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N.Y.)	80c.
Copper, red oxide	50c.
Ferro-Molyb'um (50%)	$1.25
Ferro-Titanium (10%)	90c.
Ferro-Titanium (20@25%, N. Y.)	55c.
Ferro-Tungsten (37%)	per lb. 28c.
Magnesium	$2.75
Manganese, pure (N.Y.)	60c.
Mangan'e Cop. (20% Mn)	32c.
Mangan'e Cop. (30% Mn)	38c.
Molybdenum (Best)	$1.82
Phosphorus	45c.
American	70c.
Sodium metal	50c.
Tungsten (Best)	62c.

Missouri Zinc Ore Market. April 18.

(From Our Special Correspondent.)

The purchasable stock of zinc ore has become almost a shadow of its former substance, the reserve ore in the bins being less than 4,000 tons to-day, yet the smelters have taken during the week the position that they can lower the ore market. It is reported here by the purchasing agents that three blocks each of the Lanyon Zinc Company's works and the Prime Western Spelter Company's works were closed down on account of possible labor troubles. This report was first made here nearly three weeks ago, and there is no more labor trouble to-day than there was at that time. Producers have come to the conclusion that it is a move to reduce the demand for zinc ore by preconcerted action on the part of the smelters. This is being looked into by the Missouri & Kansas Zinc Miners' Association, and it may be necessary for the producers to quit mining and milling with night shifts for a period to meet whatever contingency may arise, either from labor trouble or a move merely to cut ore prices. Only one bin of zinc ore at $42 was loaded out of Joplin this week, while another bin that sold at $42 last week was loaded out this week at $41.50. Other cuts of 50c. per ton are said to have been accepted in Joplin, yet in Carterville the price was advanced 50c. and $1 per ton on several bins. The explanation offered for this position by the purchasing agents is that prices have been relatively higher here than at Carterville. It is true that the price had reached here as high as the equivalent of $39 per ton for 60 per cent zinc, while at Webb City and Carterville the highest point was a $38 basis, and a large quantity sold on a $37 basis.

Following are the sales of zinc and lead ores from the various camps of the Joplin District for the week ending April 18, 1903:

	Zinc. Pounds.	Lead. Pounds.	Total Value.
Joplin	1,954,870	302,090	$48,084
Webb City and Carterville	1,480,950	622,070	47,230
Galena and Empire	1,181,780	127,860	25,672
Duenweg	912,480	237,520	24,344
Carthage	641,490	.....	12,830
Aurora	650,150	5,200	10,900
Alba and Neck	504,140	.....	10,083
Prosperity	382,500	7,500	7,508
Granby	409,000	28,000	6,764
Carl Junction	312,140	.....	6,243
Zincite	292,880	.....	5,858
Fortuna	270,000	.....	5,400
Oronogo	274,270	.....	5,320
Cave Spring	224,300	9,870	5,004
Mitchell	164,630	13,020	3,677
Badger	129,000	21,800	3,368
Spurgeon and Spring City	134,510	30,630	2,956
Central City	129,450	4,320	2,330
Total sales	10,048,540	1,409,880	$233,571
16 weeks total	150,088,350	17,092,700	$2,964,279

This week's shipment was les sthan last week by 1,484 tons of zinc and 32 tons of lead, and the value was $58,928 less, yet it was 324 tons of zinc and 127 tons of lead greater than an average for the 16 weeks of the year. There was an apparent offishness on the part of buyers during the week, yet every one of them bought all of the ore possible to secure without appearing to be anxious for the ore.

A year ago the highest price paid for zinc was $33 per ton, $9 less than the high price of this week, and lead sold at $43.50 per ton, or $16 less than now, the price during the week being very firm at $59.50 per ton.

Average Prices of Metals per lb., New York.

Month.	Tin. 1903.	Tin. 1902.	Lead. 1903.	Lead. 1902.	Spelter. 1903.	Spelter. 1902.
January	28.33	23.54	4.075	4.000	4.865	4.27
February	29.43	24.07	4.075	4.075	5.043	4.15
March	30.15	26.32	4.442	4.075	5.349	4.28
April	....	27.77	....	4.075	....	4.37
May	....	29.85	....	4.075	....	4.47
June	....	29.36	....	4.075	....	4.96
July	....	28.38	....	4.075	....	5.27
August	....	28.23	....	4.075	....	5.44
September	....	26.60	....	4.075	....	5.49
October	....	26.07	....	4.075	....	5.38
November	....	25.68	....	4.075	....	5.18
December	....	25.68	....	4.075	....	4.78
Year	....	26.79	....	4.069	....	4.84

Note.—The average price of spelter in St. Louis for the month of January, 1903, was 4.689c. per lb.; for February, 4.861c.; for March, 5.174c.

Average Prices of Copper.

Month.	New York Electrolytic. 1903.	New York Electrolytic. 1902.	New York Lake. 1903.	New York Lake. 1902.	London Standard. 1903.	London Standard. 1902.
January	12.159	11.053	12.361	11.322	53.52	48.43
February	12.778	12.173	12.901	12.378	57.34	55.16
March	14.416	11.882	14.572	12.188	63.85	53.39
April	.....	11.618	.....	11.986	....	52.79
May	.....	11.856	.....	12.226	....	54.08
June	.....	12.110	.....	12.360	....	53.93
July	.....	11.771	.....	11.923	....	52.89
August	.....	11.404	.....	11.649	....	51.96
September	.....	11.480	.....	11.760	....	52.68
October	.....	11.449	.....	11.722	....	52.18
November	.....	11.288	.....	11.533	....	51.03
December	.....	11.430	.....	11.599	....	50.95
Year	.....	11.626	.....	11.887	....	52.46

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Month.	1903. London. Pence.	1903. N. Y. Cents.	1902. London. Pence.	1902. N. Y. Cents.	1901. London. Pence.	1901. N. Y. Cents.
January	21.98	47.57	25.62	55.56	28.97	62.82
February	22.11	47.89	25.41	55.09	28.13	61.06
March	22.49	48.72	25.00	54.23	27.04	60.63
April	....	....	24.34	52.72	27.30	59.29
May	....	....	23.71	51.31	27.43	59.64
June	....	....	24.17	52.36	27.42	59.57
July	....	....	24.38	52.88	26.96	58.46
August	....	....	24.23	52.52	26.94	58.37
September	....	....	23.88	51.52	26.95	58.26
October	....	....	23.40	50.57	26.62	57.59
November	....	....	22.70	49.07	26.12	56.64
December	....	....	22.21	48.03	25.46	55.10
Year	....	....	24.09	52.16	27.11	58.95

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

DIVIDENDS.

Name of Company.	Date.	Per Share.	Total.	Total to Date.
†Alaska Treadwell	April 28	.37½	$75,000	$5,270,000
†Allis-Chalmers, pf.	May 1	1.75	284,375	2,775,000
†Amalgamated Copper	May 25	.50	769,430	21,195,540
§Anaconda Copper	April ..	.50	600,000	22,650,000
†Boston & Montana Cop.	April ..	2.00	300,000	27,725,000
*Cinco Senores, Mex.	April. 1	.25	15,000	137,500
Grand Central, Utah	April 20	.10	25,000	681,250
*Imperial Oil, Cal.	May 6	.20	20,000	360,000
Iron Silver, Colo.	May 1	.10	50,000	2,750,000
Penna. Steel, pf.	May 1	3.50	577,500	2,601,250
†Phila. Gas, common	May 1	1.50	231,406	2,954,019
*Standard, Idaho	April 20	.05	25,000	2,820,000
*St. Gertrudis, y An., Mex.	Apr. 26	.77	22,176	2,702,568
†Tenn. Coal, Iron & R.R.	May 1	2.00	4,960	297,135
†Texas & Pacific Coal	April 25	1.50	30,000	2,100,000
*Thirty-Three Oil, Cal.	May 6	.10	10,000	170,000
*Trinity County, Cal.	May 1	.05	5,000	25,000
§United Copper, pf., Mont.	May 1	3.00	150,000	300,000
†U. S. Steel, common	June 9	1.00	5,083,025	45,726,552
†U. S. Steel, pf.	May 15	1.75	8,929,919	80,332,910
†Vindicator Con., Colo.	April 25	.03	33,000	1,027,000
Vindicator Con., extra	April 25	.02	22,000	.....

* Monthly. † Quarterly. § Semi-annual.

ASSESSMENTS.

Name of Company.	Location. No.	Delinq.	Sale.	Amt
Alaska	Utah ..	Apr. 14	Apr. 30	.03
Alma	Cal. ..	Apr. 27	.....	.15
Caledonia	Nev. ..	Apr. 15	May 4	.15
Century	Utah ..	Apr. 19	May 18	.10
Con. New York	Nev. 17	Apr. 7	Apr. 28	.05
Gould & Curry	Nev. ..	Apr. 17	May 6	.15
Hale & Norcross	Nev. 12	Apr. 30	May 28	.10
Kentuck Con.	Nev. ..	May 6	May 29	.05
Kern Canyon Oil	Cal. ..	Apr. 27	.....	.06
Maple	Utah 8	Apr. 20	May 8	.00½
Morning Star	Nev. ..	May 1	May 21	.00½
National Con.	Cal. 17	May 4	May 30	.05
Ophir	Nev. ..	Apr. 10	Apr. 30	.15
Overman	Nev. 12	April 7	April 28	.10
Potosi	Nev. 66	May 14	June 4	.10
Provident Oil	Cal. ..	May 7	.....	.03½
Seg. Belcher & Mides	Nev. ..	May 5	May 25	.05
Silver Shield	Utah 4	Apr. 28	May 15	.02
Sonora	Mex. ..	May 6	.....	.01
Tonopah & Salt Lake	Nev. 1	Mar. 28	Apr. 17	.10
Wabash	Utah 2	Apr. 21	May 14	.05
Yellow Jacket	Nev. ..	Apr. 30	June 5	.15

STOCK QUOTATIONS.

NEW YORK.

Company and Location.	par val	Apr. 15. H.	Apr. 15. L.	Apr. 16. H.	Apr. 16. L.	Apr. 17. H.	Apr. 17. L.	Apr. 18. H.	Apr. 18. L.	Apr. 20. H.	Apr. 20. L.	Apr. 21. H	Apr. 21. L.	Sales
Acacia, Colo	$1	.....	.....	.08	.....	.....	.....	.....	.....	.09	.....	.....	.....	1,009
Alice, Mont.	25	.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33
Amalgamated c., Mont.	100	63⅜	62⅝	64½	62⅞	64⅜	63½	65¾	64½	66½	64⅜	66⅜	65⅝	178230
†Anaconda c. Mont.	25	108½	108	111¼	106½	†109	107	110	109	110	108	109	108	4,600
Anaconda Gold, Colo.	5	.....	.....	.....	.....	.....	.....	.16	.....	.....	.....	.....	.....	500
Best & Belcher, Nev.	3	2.00	.....	.....	.....	.....	.....	.....	.....	1.90	.....	1.85	.....	280
Brunswick, Cal.	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bullion, Nev.	1	.....	.....	.....	.....	.....	.....	.10	.....	.....	.....	.11	.....	900
Caledonia, Nev.	2½	.....	.....	2.65	.....	.....	.....	.....	.....	2.55	.....	.....	.....	300
Challar, Nev.	5	.30	.....	.....	.....	.33	.....	.30	.....	.29	.....	.30	.29	1,300
C. K. & N., Colo.	1	.....	.....	.....	.....	.....	.....	.....	.....	.20	.....	.....	.....	2,000
Comstock T., s., Nev.	2	.....	.....	.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Comst T Bonds	100	.....	.....	.05⅝	.....	.....	.....	.....	.....	.07	.....	.....	.....	1,000
Con. Cal. & Va., g. s.	2½	1.55	.....	.....	.....	1.45	.....	1.50	.....	.....	.....	1.50	.....	1,275
Cons. Imperial, Colo.	1	.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,000
Daly, Utah	20	.....	.....	.....	.....	.....	.....	2.00	.....	.....	.....	.....	.....	50
Elkton g., Colo.	1	.39	.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,800
El Paso, Colo.	1	.....	.....	.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Gould & Curry, Nev.	3	.27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	300
Greene Con., c., Mex.	10	21¼	23	24½	23¾	24	23⅞	23½	23⅜	23⅞	23¾	23½	22	17,100
Hale & Norcross	3	.....	.....	.68	.....	.71	.70	.....	.....	.....	.....	.....	.....	490
Homestake, S. Dak.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Isabella, g., Colo.	1	.18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,300
Jack Pot, Colo	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Justice, Nev.	1	.....	.....	.14	.13	.....	.....	.18	.....	.....	.....	.....	.....	300
Little Chief, Colo.	1	.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	300
Mexican, Nev.	3	.....	.....	.....	.....	1.10	.....	.....	.....	.....	.....	.....	.....	200
Moon-Anchor, Colo	5	.....	.....	.....	.....	.10	.....	.....	.....	.....	.....	.....	.....	500
Occidental, Nev.	1	.....	.....	.45	.....	.43	.....	.....	.....	.....	.....	.....	.....	500
Ontario, Utah	100	5.75	.....	5.13	.....	.....	.....	6.00	.....	.....	.....	.....	.....	230
Ophir, s., Nev	1	.....	.....	.....	.....	.....	.....	1.70	1.65	1.65	.....	.....	.....	800
Pharmacist, Colo.	1	.....	.....	.....	.....	.....	.....	.03½	.....	.....	.....	.....	.....	2,000
Portland, Colo	10	1.40	.....	.....	.....	1.40	.....	.....	.....	1.45	.....	.....	.....	700
Potosi, Nev.	3	.26	.....	.28	.27	.29	.28	.....	.....	.....	.....	.....	.....	800
Quicksilver, pfd.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sierra Nevada, Nev	3	.....	.....	.....	.....	.....	.....	.92	.....	.90	.....	.....	.....	200
Silver Hill, Nev	1	.....	.....	.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	200
Small Hopes, Colo.	20	.....	.....	.....	.....	.....	.....	.90	.88	.....	.....	.....	.....	300
Tenn. c., Tenn	25	.....	.....	29¾	29½	29¾	29½	30	29⅝	30¼	30	29¾	.....	2,300
Union Con., Nev.	2½	.....	.....	.....	.....	1.00	.....	.....	.....	.....	.....	.....	.....	100
Union Cop., N. C.	10	2⅜	2¼	2¼	.....	.....	.....	2½	.....	.....	.....	2⅜	.....	2,525
Virginia, M., Colo.	1	.....	.....	.....	.....	.....	.....	.....	.....	.02	.....	.....	.....	3,000
White Knob, g. s., Ida	100	.....	.....	.....	.....	12	11⅜	12¼	.....	12¾	12¼	13⅜	13	1,250
Work, Colo.	1	.....	.....	.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

† Ex-Dividend. Total sales 229,953 shares.

BOSTON, MASS.*

Name of Company.	par val	Shares listed.	Apr. 15. H.	Apr. 15. L.	Apr. 16. H.	Apr. 16. L.	Apr. 17. H.	Apr. 17. L.	Ap . 18. H.	Ap . 18. L.	Apr. 20. H	Apr. 20. L.	Apr. 21. H.	Apr. 21. L.	Sales
Adventure Con., c.	$25	100,000	.....	.....	10	.....	10	.....	.....	.....	.....	.....	9	.....	285
Allouez	25	80,000	6⅝	6¼	7	6⅜	7	6⅜	7⅛	7	.....	.....	7¼	7	3,380
Amalgamated, c.	100	1,538,879	63⅜	62	64½	62⅛	64¾	63½	65¾	.....	.....	.....	66¾	65⅜	28,087
Am. Z. L. & Sm.	25	60,000	.....	.....	11¾	10	.....	.....	.....	.....	.....	.....	.....	.....	515
Anaconda, c.	25	1,200,000	26¾	.....	.....	.....	†26⅜	.....	†27	.....	.....	.....	.....	.....	370
Arcadian, c.	25	150,000	4	3⅜	3¾	.....	4	3⅜	4½	.....	.....	.....	4¼	.....	874
Arnold	25	60,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atlantic, c.	25	100,000	11½	.....	12	11½	12⅜	12	13	.....	.....	.....	.....	.....	470
Bingham Con., g. s.	50	150,000	30	29	30¾	30	31⅜	30⅜	32	31½	.....	.....	32	.....	3,040
Bonanza	10	300,000	.....	.....	70	.....	70	.....	.....	.....	.....	.....	.....	.....	500
British Columbia	5	250,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cal. & Hecla, c.	25	100,000	520	.....	524½	520	.....	.....	525	.....	.....	.....	525	.....	111
Centennial, c.	25	90,000	23¼	22	25	24	25	24½	26¾	25	.....	.....	26¾	25¼	7,643
Central Oil	25	60,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6½	.....	200
Con. Mercur, g.	5	1,000,000	1⅝	1½	1 17/32	1½	1 17/32	1½	1½	.....	.....	.....	1 17/32	1½	4,400
Continental Zinc	25	22,000	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	130
Copper Range Con.	100	285,000	60	58½	63¼	59¾	65¼	63¼	67¼	65½	.....	.....	68	65	26,548
Daly-West., g. s.	20	180,000	†43¼	43	43	.....	43	.....	.....	.....	.....	.....	43¾	43	300
Dominion Coal,	100	150,000	.....	.....	108½	105	108½	.....	108½	107½	.....	.....	108¼	107½	680
Dominion Coal, pf.	100	30,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	118	.....	15
Dominion I & S.	100	100,000	26½	26	28	26½	28⅛	27⅛	28⅛	27¾	.....	.....	28⅝	27½	3,990
Elm River	12	150,000	3½	3⅜	4	3⅝	4¼	4	4¼	4	.....	.....	4½	4	3,595
Franklin, c.	25	100,000	10⅞	10½	10¾	.....	11	.....	11	.....	.....	.....	12	11½	260
Guanajuato, Con.	5	385,000	2	.....	2	1½	1⅝	1½	2	1⅝	.....	.....	2¼	1⅞	6,258
Isle Royale Con., c.	25	385,000	11	.....	12	11	.....	.....	.....	.....	.....	.....	.....	.....	290
Mass Con., c.	25	100,000	**10	.....	‡10	.....	‡10	.....	.....	.....	.....	.....	10⅛	10	510
Mayflower, c.	25	100,000	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60
Michigan, c.	25	100,000	8⅛	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	70
Mohawk, c.	25	100,000	50⅝	49¾	52	50½	53	52	.....	.....	.....	.....	54½	53½	1,254
Mont. Coal & Coke	25	200,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7⅛	7	200
Mont'l & Boston, c.	5	570,000	1⅛	.....	1⅛	.....	1 1/16	.....	.....	.....	.....	.....	1⅛	1¾	1,525
Napa Con., g.	7	100,000	.....	.....	.....	.....	2⅛	.....	.....	.....	.....	.....	.....	.....	100
National	25	100,000	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	45
New Idria, g.	5	100,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Old Colony, c.	25	100,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Old Dominion, c.	25	150,000	17¾	17	18	.....	18½	18	18¾	.....	.....	.....	.....	.....	875
Osceola, c.	25	96,150	66	65	63½	66	69	67	69⅛	68½	.....	.....	70	69	3,241
Parrot, s. c.	10	229,850	27½	.....	28	27½	29¼	27¾	30	29	.....	.....	30	29	995
Phoenix Con., c.	25	100,000	5½	5⅜	5¼	5	5¼	5	5	.....	.....	.....	5	.....	1,055
Quincy, c.	25	100,000	115	.....	120	115	119	.....	.....	.....	.....	.....	115	.....	106
Rhode Island, c.	25	100,000	3	.....	3	.....	.....	.....	3	.....	.....	.....	2½	.....	285
Santa Fe, g. c.	10	250,000	2⅜	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	220
Shannon, c.	10	188,296	14	13	14¼	13⅞	14⅜	14⅛	14⅜	13½	.....	.....	14⅜	14¼	9,415
Tamarack, c.	25	60,000	140	.....	155	145	148	145	150	.....	.....	.....	150	145	470
Tecumseh	25	80,000	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	150
Trimountain	25	100,000	90	.....	91½	90½	92	91½	93	92	.....	.....	92	.....	835
Trinity, c.	25	160,000	9	8½	9½	8¾	9½	9	9½	9⅛	.....	.....	9½	9	5,254
United Copper	100	450,000	.....	.....	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States, g.	25	419,000	.....	.....	26	24½	25¾	25¼	.....	.....	.....	.....	.....	.....	50
U. S. Coal & Oil	25	240,000	14	.....	14½	14	14¼	.....	14¾	14½	.....	.....	14⅞	14⅝	1,205
Utah Con., g.	5	300,000	28¾	28	29	28½	29¼	29	29⅝	29½	.....	.....	29⅞	29¼	6,189
Victoria, c.	25	100,000	6	5¾	6¼	6	6⅜	.....	6½	6⅜	.....	.....	6¾	6¼	1,840
Washington	25	60,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winona, c.	25	100,000	9¼	9¼	10½	10	10⅝	10	10¾	10	.....	.....	10½	10	4,861
Wolverine, c.	25	60,000	70	.....	72	71	72	.....	.....	.....	.....	.....	75	.....	665
Wyandot	25	100,000	.....	.....	2	1¾	2¼	2	2¼	.....	.....	.....	2¼	2	700

* Boston Stock Exchange. † Ex Dividend. ** Ex-Rights. ‡ Assessment Paid. Total sales, 139,897 shares.

COAL, IRON AND INDUSTRIAL STOCKS.*

Name of Company.	Par val	Apr 15. H.	Apr 15. L.	Apr. 16. H.	Apr. 16. L.	Apr. 17. H.	Apr. 17. L.	Apr. 18. H.	Apr. 18. L.	Apr. 20. H.	Apr. 20. L.	Apr. 21. H.	Apr. 21. L.	Sales
Allis-Chalmers, U. S.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	128
Allis-Chalm's, pf, U.S.	100	86	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Am. Agr. Chem., U.S.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	86	.....	100
Am. Agr. Chem. pf, U.S.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Am. Sm. & Ref., U.S.	100	49	48⅜	49¼	49	51	49¼	51	50⅜	51½	50	51¼	50	25,500
Am. Sm. & Ref. pf, U.S.	100	94	93	94	.....	95⅜	94	94⅞	94¼	95¼	94¾	95⅝	94¼	2,915
Am. Steel & Fdy., U.S.	100	.....	.....	.....	.....	.....	.....	.....	.....	14¼	.....	17¾	15½	1,700
Am. S. & Fdy. pf., U.S.	100	.....	.....	.....	.....	.....	.....	.....	.....	60	.....	60	.....	300
Col. Fuel & I., Colo.	100	57	56⅛	61	56½	63⅜	59	64	62⅞	65½	63⅜	64½	63⅜	38,000
Col. & H. C. & I., Colo.	100	19⅝	.....	19⅜	.....	20	.....	.....	.....	20	.....	.....	.....	1,300
†Crucible Steel, U. S.	100	18⅜	18¼	18⅜	.....	18⅜	18½	18½	18¼	.....	.....	18¾	18⅜	1,970
†Crucible Steel, pf, U S	100	83⅜	82⅞	83¼	83¼	83⅜	83¼	83½	83	83⅜	83½	.....	.....	1,020
†Mong. R. Coal, Pa.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
†Mong. R. Coal pf, Pa	100	38¾	.....	39½	.....	.....	.....	.....	.....	39⅜	39½	39¾	.....	208
National Lead, U.S.	100	24½	.....	24½	24¼	26	25	25¼	.....	.....	.....	25⅝	25½	1,680
National Lead pf, U.S.	100	.....	.....	.....	.....	.....	.....	90	.....	.....	.....	92	.....	360
†Phila Nat. Gas	100	44⅜	.....	.....	.....	.....	.....	.....	.....	.....	.....	45¼	.....	462
†Phila Nat. Gas, pf	100	.....	.....	.....	.....	.....	.....	48⅜	.....	.....	.....	.....	.....	20
†Pittsburg Coal, Pa.	100	28¼	.....	29	28¼	30⅜	29⅛	29¾	29⅜	29¼	29	29¼	29¼	10,946
†Pittsburg Coal pf, Pa	100	88	.....	88⅜	88⅜	90¼	89	89½	.....	89¾	89	89¾	89½	2,455
Republic I & S., U.S.	100	19½	18¼	19¼	19	19⅝	19¼	19¾	19¼	19¾	19½	20	19½	4,300
Republic I. & S., pf, U.S.	100	77½	.....	77¼	.....	78⅜	78½	78	.....	78½	78	79	.....	2,130
Sloss-Shef S. & I., Ala.	100	.....	.....	55	.....	56	55½	56½	.....	57½	57	62	58	9,850
Sloss-Shef S. & I. pf, Ala.	100	.....	.....	.....	.....	91½	.....	.....	.....	.....	.....	.....	.....	100
Standard Oil, U.S.	100	665	657	667	.....	665	.....	667	660	670	.....	670	668	8
Tenn. C. I. & R. R., Ala.	100	64¼	63	64⅝	64	65½	64¼	65¾	64⅝	65⅞	64½	66¼	65⅜	22,62
U. S. Red & Ref., U. S.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
U. S. Red & R. pf., U. S.	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
U.S. Steel Corp., U.S.	100	35⅜	.....	35½	34⅞	35⅝	35⅛	35¾	35⅜	35⅞	35⅜	36¼	35⅞	0,986
U.S. Steel Corp. pf, U.S.	100	85½	4⅜	85½	85	86¾	86¼	86⅞	86⅜	87	86½	87⅛	86⅞	505
Va.-Car Chem., U.S.	100	61	60½	61⅜	61	62	61⅝	61¾	61½	61⅝	.....	62⅞	62	2,925
Va.-Car Chem. pf, U.S.	100	121½	121	121½	.....	122	.....	122½	122	.....	.....	124	123¾	1,050
Va. I. C. & Coke, U. S.	100	31½	.....	.....	.....	33	32½	.....	.....	33	.....	33½	.....	500

* New York Stock Exchange. † Pittsburg Stock Exchange. ‡ Ex-Dividend. Total sales, 239,071 shares.

COLORADO SPRINGS, COLO.*

Name of Company.	Par val	Apr. 13. H.	Apr. 13. L.	Apr. 14. H.	Apr. 14. L.	Apr. 15. H.	Apr. 15. L.	Apr. 16. H.	Apr. 16. L.	Apr. 17. H.	Apr. 17. L.	Apr. 18. H.	Apr. 18. L.	Sales
Acacia	$1	.09½	.08½	.09	.08½	.09	.08¾	.08¾	.08½	.08¾	.08½	.09	.08½	6,000
Am. Con.	1	.02¾	.02⅝	.02⅞	.02⅝	.02⅞	.02⅝	.02⅞	.02¾	.02¾	.....	.027⅛	.02¾	8,000
Anaconda	1	.15½	.....	15½	.....	.15	.....	.14⅞	.13½	.14¾	.13½	.15	.13½	.....
Ben Hur	1	.....	.02¼	.....	.04	.....	.02¼	.....	.02¼	.....	.02¼	.....	.02¼	.....
Blue Bell	1	.06	.04½	.....	.04	.....	.04	.04	.06½	.....	.05	.....	.....	.....
C. C. & M.	1	.02½	.02⅛	.02½	.02¼	.02¼	.02⅛	.02⅜	.02⅝	.02½	.02⅛	.....	.02	2,000
C. K. & N.	1	.19	.17	.18⅞	.18	.19	.18	.19¼	.....	.19½	.....	.18	.19½	1,000
C. C. Con.	1	.05¾	.04⅝	.05	.04½	.05	.04¾	.05	.04¾	.05	.04½	.05	.04½	1,000
Coriolanus	1	.03½	.....	.03½	.....	.03½	.....	.04	.....	.03½	.....	.03½	.....	.....
Des Moines	1	.03½	.02¼	.....	.02	.....	.02½	.....	.02½	.03	.02½	.03¼	.02	4,000
Dr. Jack Pot	1	.08¾	.08½	.....	.08½	.10	.08½	.08¾	.08½	.08⅝	.08¾	.08⅝	.08¾	8,000
Elkton Con.	1	.37¼	.36½	.37⅜	.36¾	.38	.36	.37½	.37	.38	.37	.38	.37½	1,000
El Paso	1	.60	.58	.59½	.58	.60	.58½	.59½	.58	.58½	.....	.....	.58	200
Fannie Rawlings	1	.04	.02½	.04	.03	.....	.03	.....	.03	.03	.....	.03	.....	2,000
Findley	1	.14¾	.13	.14½	.13⅛	.15½	.15⅛	.15¾	.15¼	.16½	.15	.16	.15¾	13,000
Gold King	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34,000
Gold Dollar Con.	1	.05¼	.05	.05⅛	.05	.05	.04⅞	.05⅛	.04⅞	.05⅛	.05	.05¼	.....	.....
Golden Cycle	1	.74¼	.73	.74	.73	.73½	.73	.75	.73	.75	.73¼	.74	.73½	12,000
Golden Fleece	1	.....	.05	.11	.05	.10	.05	.10	.05	.10	.05	.11	.05	.....
Gould	1	.04	.03	.04	.03	.04	.03	.03¾	.....	.03½	.02½	.....	.02⅞	4,000
Hart	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Isabella	1	.16⅛	.15⅛	.16⅜	.16	.16½	.16	.16¾	.16	.16¼	.16	.16	.15¾	7,100
Jack Pot	1	.09	.....	.09	.....	.09	.....	.09	.....	.09	.08	.09	.....	.....
Last Dollar	1	.50	.....	.50	.....	.50	.....	.50	.....	.50	.....	.50	.....	.....
Lexington	1	.04⅛	.04⅜	.05	.04½	.05	.04⅝	.04⅞	.04⅝	.04⅞	.04¾	.04¾	.04½	.....
Little Puck	1	.04	.03¾	.04	.03¾	.04	.03¾	.04	.03¾	.04	.03⅞	.04	.03¾	10,000
Mollie Gibson	1	.07	.05½	.07	.05½	.07	.05½	.07	.05½	.07	.05½	.07	.05½	.....
Moon Anchor	1	.09	.08	.09	.08	.09	.08	.08¾	.08	.09	.08	.09	.08	.....
New Haven	1	.02¼	.02⅜	.02¼	.....	.03	.02¼	.02⅜	.02¼	.02¾	.02¼	.02¾	.02⅜	.....
Pharmacist	1	.04½	.04¼	.04½	.04¼	.04⅝	.04¼	.04⅝	.04¼	.04⅝	.04¼	.04⅝	.04¼	5,000
Pinnacle	1	.04½	.04	.....	.....	.04⅝	.04¼

STOCK QUOTATIONS.

MEXICO*. April 10.

Name of Company	Shares Issued.	Last div'd	Prices. Bid.	Prices. Ask.
Durango.				
Ca.Min. de Penoles	2,500	$50.00	$4,000	$4,500
San Andres de la Sierra	200	.....	1,000	.....
Guananjuato.				
Angustias, Pozos	2,400	5.00	85	90
Cinco Senores y An., aviadoras	2,000	15.00	185	195
Cinco Senores y An., aviada	400	10.00	180	190
Providencia, San Juan de la Luz	6,000	2.00	140	145
Queensland y Australia	300	.....	85	100
Guerrero.				
Garduno y Anexas	7,200	.....	35	60
Hidalgo.				
Amistad y Concordia	9,600	5.30	77	79
Carmen, aviada	1,100	.....	115	125
Guadalupe Fresnillo mill	1,000	.....	250	300
Guadalupe Fresnillo Mine	1,400	.....	70	80
La Blanca, aviadora	1,536	.....	1,200	1,100
La Blanca, aviada	768	.....	880	900
La Reina y An., aviadora	5,600	.....	19	21
Maravillas y An., aviador	1,680	.....	.....	.....
Maravillas el Lobo	1,000	.....	130	180
Palma y An., aviador	1,800	.....	.....	12
Real del Monte	2,554	10.00	650	700
Santa Ana y An., aviadora	1,800	.....	30	35
Santa Ana y An., aviada	600	.....	25	30
Sta. Gertrudis y An., aviadas	9,600	.....	.....	7½
Sta. Gertrudis y An., aviadora	28,800	2.00	80	81
Santo Tomas Apostol aviadoras	5,100	.....	1	2
San Felipe de Jesus, aviadora	3,600	.....	30	33
San Felipe de Jesus, aviada	1,200	.....	10	.....
San Rafael y An., Trompillo	1,200	12.00	1,080	1,100
San Rafael y An., aviada	1,200	$8.00	$400	$410
Soledad, aviada	960	8.00	340	360
Sorpresa, aviada	960	5.00	310	325
Mexico.				
Alacran	2,400	.....	30	40
Buen Despacho	3,000	.....	70	75
Dos Estrellas	3,000	30.00	2,200	2,230
La Esperanza (El Oro)	3,000	10.00	1,170	1,190
La Reformia, aviadores	2,000	.....	55	57
Santa Ana, Esperanza	2,400	.....	70	90
Michoacan.				
Luz de Borda, aviadora	3,000	.....	34	38
Luz de Borda, aviada	1,000	.....	10	14
San Luis Potosi.				
Concepcion y An	3,000	.....	110	130
El Barreno, aviadora	2,000	2.00	45	48
Sta. Maria de la Paz	2,400	10.00	.....	.....
San Diego y Annexas	2,400	4.00	10	15
Zacatecas.				
Asturiana y An	2,500	.....	35	60
Candelaria y Pinos	2,500	10.00	250	260
Esperanza y An	2,400	.....	50	40
Lourdes	2,500	.....	20	30
Luz de Minillas, pagadoras	2,000	.....	25	30
San Carlos y Annexas	2,500	20.00	150	170
Sta. Maria de Gaud.	2,500	10.00	55	65
Miscellaneous.				
Bartolome de Medina	2,000	1.50	70	75
Guadalupe Hacienda	10,000	6.00	.....	.....
La Luz Hac. (Pachuca)	3,750	.....	300	305
La Reina (Chihuahua)	192	.....	.....	.....
Naica (Chihuahua)	100	.....	6,000	.....
Natividad (Oaxaca) aviadora	1,800	8.00	700	900
Natividad (Oaxaca) aviadas	600	4.00	700	900
San Francisco Hac.	6,000	1.00	52	55
Santa Ana Huantla Morelos	4,000	.....	.....	.....
Union Hacienda	3,000	5.00	240	260

*Values are in Mexican currency.

SAN FRANCISCO (*By Telegraph*).

Name of Company.	April. 20.	April. 21.	Name of Company.	April. 20.	April. 21.
Belcher	.52	.51	Justice	.11	.10
Best & Belcher	1.70	1.70	Mexican	1.05	1.00
Caledonia	2.30	2.30	Occidental Con	.40	.42
Challenge Con	.50	.50	Ophir	1.70	1.60
Chollar	.28	.27	Overman	.53	.53
Confidence	1.20	1.20	Potosi	.25	.25
Con. Cal. & Va.	1.55	1.45	Savage	.24	.23
Con. Imperial	.01	.02	Sierra Nevada	.86	.79
Crown Point	.30	.28	Union Con	.96	.92
Gould & Curry	.30	.41	Utah Con	.41	.40
Hale & Norcross	.73	.73	Yellow Jacket	.31	.32

SALT LAKE CITY.* Apr. 17.

Name of Company	Shares.	Par Val	High	Low	Sales.
Ben Butler	.....	.....	.09	.09	500
California	300,000	$1	.15	.14½	1,125
Carisa	500,000	1	.16	.15¼	4,400
Century	150,000	1	.48	.47½	400
Creole	.....	.....	.59	.55	200
Con. Mercur	1,000,000	5	1.49½	1.46	6,965
Daly	.....	.....	2.40	2.40	100
Daly-Judge	300,000	1	9.80	8.55	3,955
Daly-West	180,000	20	43.17½	42.47½	1,980
Dexter	.....	.....	.13	.13	500
E. & B. Pencil	.....	.....	1.11½	.90	4,575
Grand Central	250,000	1	5.25	5.20	400
Ingot	.....	.....	.04¾	.04¾	1,200
L. Mammoth	150,000	1	.57½	.37½	23,000
May Day	.....	.....	.18½	.16	7,200
M. Washington	.....	.....	.03½	.02½	19,300
N. Y. Bonanza	.....	.....	.23½	.22¼	5,700
Sacramento	1,000,000	5	.27¼	.26½	12,550
Silver Shield	.....	.....	.07	.07	5,000
Star Con	500,000	1	.14	.14	1,000
Swansea	.....	.....	.79	.79	100
Uncle Sam	.....	.....	.21½	.21	700
Utah	.....	.....	.74½	.73	1,700
Victor	500,000	1	.25	.25	200
Wabash	.....	.....	.29	.24½	17,000
Yankee Con	500,000	1	.35	.33	3 500

All mines are in Utah. *By our Special Correspondent. Total sales, 125,250 shares.

ST. LOUIS, MO.* Apr. 18.

Name.	Capital Stock.	Par Val.	Prices. Bid.	Prices. Ask.
Ad.-Nettie, Colo.	$3,000,000	$10	$0.35	$0.65
Catherine Lead, Mo.	500,000	10	1.80	3.50
Central Coal & C.	1,875,000	100	65.25	66 00
Central C. & C., pf.	1,875,000	100	75 00	77 00
Central Lead, Mo.	1,000,000	10	130 00	145.00
Columbia Lead, Mo.	$500,000	10	$11.00	$12.50
Con. Coal, Ill.	500,000	100	21.75	23.00
Doe Run Lead Co.	1,500,000	100	105.00	110.00
Granite Bimet., Mt.	1,000,000	10	0 76	0.85
St. Joe Lead, Mo.	6,000,000	10	16 00	17.00

* From our Special Correspondent.

PHILADELPHIA, PA.*

Name and Location of Company.	par val	Apr. 15. H.	Apr. 15. L.	Apr. 16. H.	Apr. 16. L.	Apr. 17. H.	Apr. 17. L.	Apr. 18. H.	Apr. 18. L.	Apr. 20. H.	Apr. 20. L.	Apr. 21. H.	Apr. 21. L.	Sales
Am. Alkali, Mich	$50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Am. Cement	10	8	.....	.....	.....	8	7⅞	.....	.....	.....	.....	8	.....	230
Cambria Iron, Pa.	50	.....	.....	.....	.....	49	.....	.....	.....	.....	.....	.....	.....	73
Cambria Steel, Pa.	50	24⅜	24	24¼	24¼	25	24⅜	.....	.....	24¼	24⅜	24¼	24⅜	3,137
Penn. Steel, pfd.	100	94	.....	.....	.....	.....	.....	.....	.....	.....	.....	93	.....	5
Susq. I. & S., Pa.	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United Gas I., Pa.	50	108	106¾	107	.....	108¾	107¾	.....	.....	108¼	107¾	108⅜	108¼	3,244
Warwick I. & Steel	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5½	.....	100

*Reported by Townsend, Whelen & Co., 309 Walnut St., Philadelphia, Pa. Total sales 6,789 shares.

LONDON. April 8.

Name and Country of Company	Shares Issued.	Par value. £.	s.	d.	Latest dividend. Amt. s.	d.	Date	Quotations. Buyers. £	s.	d.	Sellers. £	s.	d.
Alaska-Treadwell, g., Alaska	200,000	5	0	0	1	6	Apr., 1903	4	7	6	4	12	6
Anaconda, c. s., Montana	1,200,000	5	0	6	2	0	Apr., 1903	5	10	0	5	12	6
Arizona, c., Def., ord	63,444	1	0	0	5	6	Feb., 1903	7	15	0	8	5	0
Arizona, pref., ord	316,350	1	0	0	5	6	Feb., 1903	8	0	0	8	5	0
Camp Bird, g., Colorado	738,000	1	0	0	0	7½	Mar., 1903	1	10	6	1	11	6
Copiapo, c., Chile	112,500	2	0	0	6	10½	Mar., 1903	2	5	0	2	10	0
De Lamar, g. s., Idaho	80,000	1	0	0	2	0	Nov., 1902		11	3		13	9
Enterprise, g., British Col	165,000	1	0	0					2	6		7	6
El Oro, g., Mexico	1,000,000	1	0	0	1	6	Dec., 1902	1	11	3	1	13	9
Frontino & Bolivia, g., Colombia	128,662	1	0	0	3	0	July, 1901		17	6	1	0	0
Le Roi, g., British Col	200,000	5	0	0	5	0	Nov., 1899	1	8	9	1	11	3
Le Roi No. 2, g., British Col	120,000	5	0	0	5	0	May, 1902		17	6	1	0	0
Mesquital, Mexico	250,000		2	0		3	Feb., 1903		4	0		5	0
Montana, g. s., Montana	657,128	1	0	0		6	April, 1899		2	0		2	6
Mountain, c., Cal.	250,000	5	0	0	4	0	Nov., 1902	3	5	0	3	10	0
Stratton's Independence, Colorado	1,000,007	1	0	0		6	April, 1902		9	6		10	6
St. John del Rey., g., Brazil	546,265	1	0	0		6	Dec., 1902		16	6		17	6
Utah Con., g. c., (Highland Boy), Utah	300,000	1	0	0	7	0	Jan., 1903	5	10	0	6	0	0
Ymir, g., British Col	200,000	1	0	0	1	0	Mar., 1902		7	6		10	0
European:													
Linares, l., Spain	15,000	3	0	0		9	Oct., 1902	3	15	0	4	5	0
Mason & Barry, c., sul., Port'g'l	185,172	1	0	0	11	0	May, 1903	3	17	6	4	2	6
Rio Tinto, c., Spain	325,000	5	0	0	27	6	Apr., 1903	49	10	0	49	15	0
Rio Tinto, pref., Spain	325,000	5	0	0	2	6	Apr., 1903	6	0	0	6	5	0
Tharsis, c., Spain	625,000	2	0	0	6	0	Apr , 1903	4	5	0	4	10	0
Australia and New Zealand:													
Assoc. Gold Mines, W. Australia	495,388	1	0	0	1	6	Jan., 1900	2	1	3	2	3	9
Briseis, Tin, Tasmania	600,000	1	0	0	.....		.....		8	0		9	0
Broken Hill Pr'p., s., N. S. Wales	960,000		8	0	1	0	Feb., 1903	1	12	6	1	15	0
Cosmopolitan Prop., W. Australia	385,000	1	0	0		6	July, 1902		15	6		16	6
Golden Horse Shoe, W. Australia	300,000	5	0	0	0	0	Apr., 1903	11	2	6	11	5	0
Great Fingall Con., W. Australia	250,000	1	0	0	5	0	Sept., 1902	7	15	0	7	17	6
Great Bo'd'r Pr'p., W. Australia	1,750,000		2	0		6	Mar., 1903	1	1	9	1	2	3
Ivanhoe Gold Corp. W. Australia	200,000	5	0	0	4	0	Jan., 1903	9	11	3	9	13	9
Kalgurli, g., W. Australia	120,000	1	0	0	2	6	Apr., 1903	4	6	3	4	8	9
Lake View Cons., g., W. Australia	250,000	1	0	0	rts.		Aug., 1902	2	17	6	2	18	9
Mt. Lyell M. & R. I., c., Tasmania	275,000	3	0	0	1	0	Apr., 1903	3	3	9	3	6	3
Mt. Morgan, g., Queensland	1,000,000	1	0	0		3	Mar., 1903	4	0	0	4	5	0
Waihi, g., New Zealand	497,412	1	0	0	2	6	Mar., 1903	5	1	3	5	3	9
Indian:													
Champion Reef, g., Colar Fields	473,000		10	0	4	6	May., 1903	7	5	0	7	7	6
Mysore Gold, Colar Fields	530,000		10	0	5	0	Mar., 1903	7	1	3	7	3	9
Nundydroog, g., Colar Fields	484,000		10	0	1	6	Mar., 1903	2	5	0	2	7	6
Ooregum, g., Colar Fields	343,000		10	0	1	6	Apr., 1903	1	16	3	1	18	9
Ooregum, pref., g., Colar Fields	240,000		10	0	1	6	Apr., 1903	2	6	3	2	8	9
African:													
Angelo, g, Transvaal	600,000	1	0	0	6	0	Feb., 1903	7	3	9	7	6	3
Bonanza, g., Transvaal	200,000	1	0	0	12	0	Feb., 1903	5	0	0	5	5	0
British South Africa	4,436,019	1	0	0	rts.		May, 1899	3	2	6	3	5	0
Cape Copper, S. Africa	300,000	2	0	0	8	0	Jan., 1902	2	18	9	3	1	3
Cape Copper, pref., S. Africa	75,000	2	0	0	2	3	Jan., 1903	3	2	6	3	7	6
City and Sub'n (New), g., Transvaal	340,000	4	0	0	8	0	Aug., 1899	6	8	9	6	11	3
Crown Reef, g., Transvaal	120,000	1	0	0	11	0	May., 1903	17	10	0	18	0	0
De Beers Con., d., pref., Cape Colony	800,000	2	10	0	10	0	Mar., 1903	19	7	6	19	10	0
De Beers Con., def	1,000,000	2	10	0	12	6	Mar., 1903	21	8	9	21	11	3
East Rand, Prop, Transvaal	970,000	1	0	0	rts.		May, 1902	8	3	9	8	6	3
Ferreira g., Transvaal	90,000	1	0	0	2	0	May., 1903	22	10	0	23	0	0
Geldenhuis Est., g., Transvaal	200,000	1	0	0	5	0	Feb., 1903	6	12	6	6	15	0
Geduld, g , Transvaal	400,000	1	0	0	rts.		Mar., 1902	7	16	3	7	18	9
Henry Nourse, g., Transvaal	125,000	1	0	0	8	0	Feb., 1903	9	2	6	9	7	6
Jagersfontein, d., Orange F. S.	200,000	5	0	0	6	0	Nov., 1899	27	5	0	27	10	0
Jubilee, g., Transvaal	50,000	1	0	0	bonus.		Aug., 1902	5	2	6	5	7	6
Jumpers, Transvaal	100,000	1	0	0	5	0	Aug., 1899	3	17	6	4	2	6
Langlaagte Est., g., Transvaal	470,000	1	0	0	3	0	Sept., 1899	4	2	6	4	5	0
May Con., g., Transvaal	288,750	1	0	0	3	0	Feb., 1903	4	10	0	4	12	6
Meyer & Charlton, g., Transvaal	100,000	1	0	0	3	0	Feb., 1903	5	7	6	5	12	6
Namaqua, c., Cape Colony	94,331	2	0	0	2	0	June, 1902	3	10	0	3	15	0
Primrose (New), g., Transvaal	325,000	1	0	0	2	0	Feb., 1903	3	17	6	4	0	0
Rand Mines, g., S. Africa	1,795,956		5	0	4	0	Aug., 1902	11	1	3	11	3	9
Robinson, g., Transvaal	750,000	5	0	0	6	0	Feb., 1903	10	12	6	10	17	6
Robinson Deep, g., Transvaal	950,000	1	0	0	5	0	May, 1899	5	6	3	5	8	9
Rose Deep, Transvaal	425,000	1	0	0	2	0	Feb. 1903	9	2	6	9	7	6
Salisbury, g., Transvaal	100,000	1	0	0	2	0	Mar., 1899	2	10	0	2	15	0
Sheba, g., Transvaal	1,075,000	1	0	0		6	July, 1898	1	3	5	1	5	0
Village Main Reef, Transvaal	400,000	1	0	0	5	0	Oct., 1902	8	16	3	8	18	9
Wemmer, Transvaal	80,000	1	0	0	10	0	Jan., 1903	12	10	0	13	0	0

c.—Copper. d.—Diamonds. g.—Gold. l.—Lead. s.—Silver.

LONDON. (*By Cable*).*

Name of Company.	Apr. 14. £.	s.	d.	Apr. 21. £.	s.	d.
Anaconda	5	10	0	5	12	6
British South Africa	3	3	9	3	3	9
Camp Bird	1	15	0	1	15	9
Con. Gold-Fields	7	17	6	7	15	0
De Beers Con. def	21	13	9	22	0	0
East Rand	8	6	9	8	3	9
El Oro, Mex	1	12	6	1	13	9
Jagersfontein	28	2	6	28	12	6
Johannesburg Invest	3	6	3	3	5	0
Modderfontein	11	5	10½	10	1	3
Rand Mines	11	2	6	11	2	6
Rio Tinto com	50	2	6	50	10	0
Simmer & Jack	1	13	9	1	13	9
Tomboy	2	0	0	2	0	0

* Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS. April 8.

Name of Company.	Country.	Product.	Capital Stock. Francs.	Par value. Fr.	Latest divs. Fr.	Prices. Opening. Fr.	Prices. Closing Fr.
Boleo	Lower Cal.	Copper	.....	500	176.00	1,420.00	1,470.00
Champ d'Or	S. Africa	Gold	3,375,000	25	3.75	21.25	22.25
Fraser River	Brit. Col'mb.	Gold	250,000	25	.....	6.50	6.50
Huanchaca	Bolivia	Silver	40,000,000	125	5.00	108.00	108.00
Metaux, Cie. Fran. de	France	Metal dealers.	25,000,000	500	22.50	485.50	496.00
Nickel	N. Caled'nia	Nickel	15,000,000	250	22.50	470.00	460.00
Rebecca	Colo'do, U. S.	Gold	5,000,000	25	.....	0.75	0.75
Vielle Montagne	Belgium	Zinc	9,000,000	30	30.00	655.00	680.00

TORONTO, ONT.* Apr. 18.

Name of Company.	par val	Prices. High.	Prices. Low.	Sales.	Name of Company	Par val	Prices. High.	Prices. Low.	Sales.
Black Tail	$1	.07¾	.04½	.....	Granby Smelter	$10	500	450	.....
Cariboo (Mc. K.)	1	.16	.12	9,500	Mountain Lion	1	.15	.11	.....
Cariboo (Hyd.)	1	.75	.....	.....	North Star	1	.15	.11¼	.....
Center Star	1	.32	.28	.....	Nova Scotia Steel, com	100	.....	.....	.....
Crows Nest, C.	100	.....	.....	.....	Payne	1	.20	.18	3,500
Dominion Coal, com	100	.....	.....	.....	Rambler Cariboo	1	.35	.25	.....
Dominion S. & I.	100	.....	.....	.....	Republic	1	.07	.05	.....
Dominion S. & I., pref.	100	68½	64	.....	St. Eugene	1	.45	.35	.....
Fairview	1	.06¼	.05½	17,000	Virtue	1	.09	.07	.....
Giant	1	.03½	.02	.....	War Eagle Con	1	.16	.12	.....

*Standard Stock and Mining Exchange. Total sales 30,000 shares

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

	Cust.	Meas.	Price.
ABRASIVES—			
Carborundum, f.o.b. Niagara Falls, Powd., F.FF.FFF.	lb.		$0.08
Grains	"		.10
Corundum, N. C.	"		.07@.10
Chester, Mass.	"		.04½@.05
Barry's Bay, Ont.	"		.07½@.09½
Mont. car-lots, f.o.b., Chicago	"		.07@.07½
Crushed Steel, f.o.b. Pittsburg	"		.05½
Emery, Turkish flour in kegs	"		.03½
Grains, in kegs	"		.05@.05½
Naxos flour, in kegs	"		.03½
Grains, in kegs	"		.05@.05½
Chester flour, in kegs	"		.03½
Grains, in kegs	"		.05@.05½
Peekskill, f.o.b. Easton, Pa., flour, in kegs	"		.01½
Grains, in kegs	"		.02½
Crude, ex-ship N. Y.; Abbott (Turkey)	lg.ton		26.50@30.00
Kuluk (Turkey)	"		22.00@24.00
Naxos (Greek) h. gr.	"		26.00
Garnet, as per quality	sh.ton		25.00@35.00
Pumice Stone, Am. Powd	lb.		.01⅝@.02
Italian, powdered	"		.01½
Lump, per quality	"		.04@.40
Rottenstone, ground	"		.02½@.04½
Lump, per quality	"		.06@.20
Rouge, per quality	"		.10@.30
Steel Emery, f.o.b. Pittsburg	"		.07
ACIDS—			
Boracic, crystals	"		.10¾@.11
Powdered	"		.11¼@.11½
Carbonic, liquid gas	"		.12½
Chromic, crude	"		.20
Hydrofluoric, 30%	"		.03
48%	"		.05
60%	"		.11
Sulphurous, liquid anhy. f.o.b. Bound Brook, N.J.	"		.06
ALCOHOL—Grain	gal.		2.41@2.43
Refined wood 95@97%	"		.60@.65
Purified	"		1.20@1.50
ALUM—Lump	100 lbs.		1.65
Ground	"		1.70
Porous	"		.80
Chrome, com'l	"		2.75@3.00
ALUMINUM—			
Nitrate	lb.		1.50
Oxide, com'l, common	"		.06½
Best	"		.20
Pure	"		.80
Hydrated	100 lbs.		2.60
Sulphate, com'l	"		1.25@1.50
AMMONIA—			
Aqua, 16°	lb.		.03
18°	"		.03¼
20°	"		.03¾
26°	"		.05½
AMMONIUM—			
Carbonate, lump	"		.07½
Powdered	"		.08¼
Muriate	"		.05⅝
Lump	"		.09
Nitrate, white pure (99%)	"		.12
Phosphate, com'l	"		.09
Pure	"		.12
ANTIMONY—Glass	"		.30@.40
Needle, lump	"		.05½@.06
Powdered, ordinary	"		.05¾@.07¼
Oxide, com'l white, 95%	"		.09½
Com'l white, 95%	"		.12
Com'l gray	"		.07
Sulphuret, com'l	"		.16
ARSENIC—White powd.	"		.03⅛@.03¼
Red	"		.06½@.06¾
ASPHALTUM—			
Ventura, Cal.	sh.ton		32.00
Cuban	lb.		.01½@.03½
Egyptian, crude	"		.05½@.06
Trinidad, refined	sh. ton		35.00
San Valentino (Italian)	lg. ton		16.00
Seyssel (French), mastic	sh. ton		21.00
Gilsonite, Utah, ordinary	lb.		.03
Select	"		.03¾
BARIUM—			
Carb. Lump, 80@90%	sh.ton		25.00@27.50
92@98%	"		26.00@29.00
Powdered, 80@90%	lb.		.01¾@.02
Chloride, com'l	100lbs.		1.67½@1.76
Chem. pure cryst	lb.		.05
Nitrate, powdered	"		.05⅞

	Cust.	Meas.	Price.
BARIUM			
Sulphate (Blanc Fixe)	lb.		$0.01⅞
BARYTES—			
Am. Crude, No. 1	sh.ton		9.00
Crude, No. 2	"		8.00
Crude, No. 3	"		7.75
Floated	"		18.75
Foreign, gray	"		14.00
Snow white	"		17.00
Floated	"		18.75
BAUXITE—Ga. or Ala. Mines:			
First Grade	lg.ton		5.50
Second grade	"		4.75
BISMUTH—Subnitrate	lb.		2.00
Subcarbonate	"		2.25
BITUMEN—"B"	"		.03½
"A"	"		.05
BONE ASH	"		.02¼@.02½
BORAX	"		.07¼@.07½
BROMINE—Bulk.	"		.35
CADMIUM—Metallic	"		1.40
Sulphate	100 lbs.		2.00@2.50
CALCIUM—Acetate, gray	"		1.40
" brown	"		.95
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh.ton		70.00
Carbonate, ppt.	lb.		.05
Chloride	100 lbs.		.70@.90
CEMENT—			
Portland, Am., 400 lbs.	bbl.		2.00@2.15
Foreign	"		1.95@2.50
"Rosendale," 300 lbs	"		.80
Slag cement, imported	"		1.65
CERESINE—			
Orange and Yellow	lb.		.13
White	"		.14
CHALK—Lump, bulk	sh.ton		3.25
Ppt. per quality	lb.		.04¼@.05¼
CHLORINE—Liquid	"		.30
Water	"		.10
CHROME ORE—			
(50% ch.) ex-ship N. Y.	lg.ton		24.75
Bricks f.o.b. Pittsburg	M		175.00
CLAY, CHINA—Am. com., ex-dock, N. Y.	lg.ton		8.25
Am. best, ex-dock, N. Y.	"		9.25
English, common	"		10.50
Best grade	"		17.00
Fire Clay, ordinary	sh.ton		4.25
Best	"		6.00
Slip Clay	"		5.00
COAL TAR PITCH	gal.		.08
COBALT—Carbonate	lb.		1.75
Nitrate	"		1.50
Oxide—Black	"		2.26@2.30
Gray	"		2.28@2.40
Smalt, blue ordinary	"		.06
Best	"		.20
COPPERAS—in bulk	100 lbs.		.42½
In bbls	"		.47½
COPPER—Carbonate	lb.		.18@.19
Chloride	"		.25
Nitrate, crystals	"		.35
Oxide, com'l	"		.19
CRYOLITE	"		.06½
EXPLOSIVES—			
Blasting powder, A	25 lb. keg		.65
Blasting powder, B	"		1.40
"Rackarock," A	lb.		.25
"Rackarock," B	"		.18
Judson R.R. powder	"		.10
Dynamite (20% nitro-glycerine)	"		.13
(30% nitro-glycerine)	"		.14
(40% nitro-glycerine)	"		.15
(50% nitro-glycerine)	"		.16½
(60% nitro-glycerine)	"		.18
(75% nitro-glycerine)	"		.21
Glycerine for ultro, (32-2-10° Be.)	"		.13⅞@.14
FELDSPAR—Ground	sh.ton		8.00@9.00
FLINT PEBBLES—Dan. Best.	lg.ton		14.75
French, Best	"		11.75
FLUORSPAR—			
Am. lump, 1st grade	sh.ton		14.40
2d grade	"		13.90
Gravel and crushed, 1st gr	"		13.40
2d grade	"		12.40
Ground, 1st grade	"		17.90
Ground, 2d grade	"		16.50
Foreign, lump	"		8.00@12.00
Ground	"		11.50@14.00
FULLER'S EARTH—	100 lbs.		.80

	Cust.	Meas.	Price.
GRAPHITE—Am. f.o.b. Providence, R. I., lump	sh.ton		$8.00
Pulverized	"		30.00
German, com. pulv.	lb.		.01¼@.01½
Best pulverized	"		.01½@.02
Ceylon, common pulv.	"		.02¾@.03½
Best pulverized	"		.04@.08
Italian, pulv	"		.01¼
GYPSUM—Ground	sh.ton		8.00@8.50
Fertilizer	"		7.00
Rock	lg.ton		4.00
English and French	"		14.00@16.00
INFUSORIAL EARTH—Gr'd.			
American best	"		20.00
French	"		37.50
German	"		40.00
IODINE—Crude	100 lbs.		2.45
IRON—Muriate	lb.		.05
Nitrate, com'l	"		.01¼
True	"		.04
Oxide, pure copperas color.	"		.05@.10
Purple-brown	"		.02
Venetian red	"		.01@.01½
Scale	"		.01@.03
KAOLIN—(See China Clay.)			
KRYOLITH—(See Cryolite.)			
LEAD—Acetate, white	"		.08¼@.08½
Brown	"		.06¼@.06½
Nitrate, com'l	"		.06½
" gran.	"		.08¼
LIME—Com., abt. 250 lbs.	bbl.		.75
Finishing	"		.95
MAGNESITE—Greece.			
Crude (95%)	lg. ton		5.50@6.00
Calcined	sh.ton		17.50@18.00
Bricks	M		170.00
Am. Bricks, f.o.b. Pittsburg	"		175.00
MAGNESIUM—			
Carbonate, light, fine pd.	lb.		.05
Blocks	"		.07@.09
Chloride, com'l	"		.01¾
Fused	"		.20
Nitrate	"		.60
Sulphate	100 lbs.		.75@.95
MANGANESE—Powdered, 70@75% binoxide	lb.		.01¼@.01½
Crude pow'd. 75@85% binoxide	"		.01½@.02¼
85@90% binoxide	"		.02¼@.03¼
90@95% binoxide	"		.03¼@.05½
Carbonate	"		.16@.20
Chloride	"		.04
Ore, 50%, Foreign	unit		.18@.19
Domestic	"		.30
MARBLE—Flour	sh.ton		6.00@7.00
MERCURY—Bichloride	lb.		.77
MICA—N. Y. gr'nd, coarse	sh.ton		33.00@38.00
Fine	lb.		.00⅞@.02
Sheets, N. C., 2x4 in.	"		.30
3x3 in.	"		.80
3x4 in.	"		1.50
4x4 in.	"		2.00
6x6 in.	"		3.00
MINERAL WOOL—			
Slag, ordinary	sh.ton		19.00
Selected	"		25.00
Rock, ordinary	"		32.00
Selected	"		40.00
NICKEL Oxide, No. 1	lb.		1.00
No. 2	"		.60
Sulphate	"		.20@.21
OILS—Black, reduced 29 gr.:			
25@30, cold test	gal.		.11½@.12½
15, cold test	"		.12½@.12¾
Zero	"		.13½@.13¾
Summer	"		.11@.12
Cylinder, dark steam ref.	"		.10¼@.11¾
Dark, filtered	"		.15½@.17½
Light, filtered	"		.16½@.19
Extra cold test	"		.27½@.31½
Gasoline, 86°@90°	"		.16@.21
Naphtha, crude, 68°@72°	bbl.		11.20
"Stove"	gal.		.14½
Linseed, domestic raw	"		.41@44
Boiled	"		.46
Calcutta, raw	"		.75
OZOKERITE	lb.		.11½
PAINTS AND COLORS—			
Chrome green, common	"		.03
Pure	"		.16
Yellow, common	"		.10¼
Best	"		.25
Lampblack, com'l	"		.04½
Refined	"		.07
Litharge, Am. pow'd	"		.05¾@.05¾
English flake	"		.08¼@.08½
Glassmakers'	"		.07¾@.08⅛

	Cust.	Meas.	Price.
PAINTS AND COLORS—			
Metallic, brown	sh.ton		$19.00
Red	"		16.00
Ocher, Am. common	"		9.25@10.00
Best	"		21.25@25.00
Dutch, washed	lb.		.04¾
French, washed	"		.01½@.01⅝
Orange mineral, Am.	"		.08½@.08⅝
Foreign, as to make	"		.08½@.10¾
Paris green, pure, bulk	"		.12
Red lead, American	"		.06¼@.06½
Foreign	"		.06⅝@.07¾
Turpentine, spirits	gal.		.53@53½
White lead, Am., dry	lb.		.05½@.05¾
American, in oil	"		.06⅝@.06¾
Foreign, in oil	"		.07@.07¼
Zinc, white, Am., ex dry	"		.04⅝@.04¾
Foreign, red seal, dry	"		.06@.08½
Green seal, dry	"		.06½@.09½
POTASH			
Caustic, ordinary	"		.04½@.04⅞
Elect. (90%)	"		.06¼
POTASSIUM—			
Bicarbonate cryst	"		.08¼
Powdered or gran.	"		.14
Bichromate, Am.	"		.08¼@.08¼
Scotch	"		.08½@.09
Bromide, bulk	"		.22
Carbonate (80@85%)	"		.03½@.04
Chlorate, f.o.b. works	"		.07@.07½
Foreign, f.o.b. N. Y.	"		.07⅛@.07¼
Chromate	"		.35
Cyanide (98@99%)	"		.20
Kainit	lg.ton		9.30
Manure salt, 20%	100 lbs.		.06
D'le Manure Salt, 48@53%	"		1.12
Muriate, 80@85%	"		1.83
95%	"		1.86
Permanganate	lb.		.09¼@.10
Prussiate, yellow	"		.13¼@.13½
Red	"		.34
Sulphate, 90%	100 lbs.		2.11
96%	"		2.14
Sylvanit	unit		.41
QUARTZ—(See Silica).			
SALT—N. Y. com. fine 280 lbs	bbl.		.72@1.18
N. Y. agricultural	sh.ton		4.40
SALTPETRE—Crude	100 lbs.		3.35
Refined	"		4.25@4.62½
SILICA—Best foreign	lg.ton		10.00@11.00
Ground quartz, ord.	sh.ton		6.00@8.00
Best	"		12.00@13.00
Lump quartz	"		2.50@4.00
Glass sand	"		2.75
SILVER—Chloride	oz.		.65
Nitrate Crystals	"		.31½
Oxide	"		.85@1.10
SODIUM—			
Bicarb., ordinary, f.o.b. w'ks	100 lbs.		1.25
Bichromate	"		1.60
Foreign, f.o.b. N. Y.	"		3.50
Extra domes. f.o.b. w'ks	lb.		.06¼
Carbonated ash, high test, in bags, f.o.b. works	100 lbs.		.72½@.75
Foreign, f.o.b. N. Y.	"		.90@.92½
Caustic, 60@78%, f.o.b. w'ks	"		1.65@1.70
Foreign, f.o.b. N. Y.	"		1.90@2.00
Chlorate, com'l	"		.07¼@.07¾
Hyposulphite, Am.	"		1.60@1.65
German	"		1.70@1.90
Nitrate, spot	"		2.00
Shipments	"		1.90
Peroxide	lb.		.45
Phosphate	"		.02½@.02¼
Prussiate	"		.09¾
Sal soda, f.o.b. works	100 lbs.		.55
Foreign, f.o.b. N. Y.	"		.67½
Silicate, conc.	"		.05
Com'l	"		.01
Sulphate, com'l	100 lbs.		82½
Sulphide	lb.		.01¼
Sulphite crystals	"		.02½
SULPHUR—Roll	100 lbs.		1.85
Flour	"		1.90
Flowers, sublimed	"		2.15
TALC—N. C., 1st grade	sh.ton		18.00
N. Y., Fibrous, best	"		10.20
French, best	100 lbs.		1.25
Italian, best	"		1.62½
TAR—Regular	bbl.		2.40
Oil barrels	"		4.40
TIN—Crystals	lb.		.22
Oxide	"		.45
URANIUM—Oxide	"		2.25@3.00
ZINC—Metallic, ch. pure	"		.07@.09⅞
Carbonate, ppt.	"		.09
Chloride solution, com'l	"		.02¼
Chloride granular	"		.04¼@.04⅝
Dust	"		.04⅝@.04½
Sulphate	"		.02½@.02⅝

THE RARE EARTHS.

BORON—Nitrate	lb.		$1.50
CALCIUM—Tungstate (Scheelite)	"		.60
CERIUM—Nitrate	"		10.00
DIDYMIUM—Nitrate	"		35.00
ERBIUM—Nitrate	"		40.00
GLUCINUM—Nitrate	"		20.00
LANTHANUM—Nitrate	"		30.00
LITHIUM—Carbonate	"		1.35
LITHIUM—Nitrate	oz.		.60
STRONTIUM—Nitrate	lb.		.07⅞@.08⅛
THORIUM—Nitrate 49@50%.	"		4.50
URANIUM—Nitrate	oz.		.25
YTTRIUM—Nitrate	lb.		40.00
ZIRCONIUM—Nitrate	"		8.00

NOTE.—These quotations are for wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.